

10/631,382

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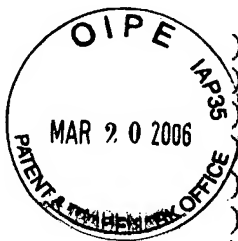
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

DOUGLAS SWINGLEY

Application No.: 10/631,382

Filed: July 30, 2003

For: CPVC DRAIN WASTE AND VENT
FITTING

Group Art Unit: 3752

Examiner: Hook, James

DECLARATION OF DOUGLAS SWINGLEY UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

1. I, Douglas Swingley, declare that I am the Plant Engineer for Spears Manufacturing Company. I have 15 years of experience in the research, development, and testing of plastic pipe fittings and valves.

2. Attached hereto as Exhibit 1 to this Declaration is a true and complete copy of a printout made on February 13, 2006 of Spears' computer records relating to Purchase Order No. 0136012, which was the first order placed by Spears with one of its vendors for CPVC pipe to be sold with DWV fittings as the LABWASTE™ CPVC Corrosive Waste Drainage System. The first page of this printout indicates that the order was placed on August 30, 2002. I personally approved this order, and can verify the date indicated in the printout. The second page of the printout indicates the items ordered, namely CPVC pipe. Certain confidential information, including price and quantity information, has been crossed out in the attached copy.

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3. When Spears launched the LABWASTE™ CPVC Corrosive Waste Drainage System, Spears did not manufacture CPVC pipes. Therefore, the pipes ordered in Purchase Order No. 0136012 were the first which could have been sold by Spears with the LABWASTE™ System. In addition, the first CPVC DWV fittings sold by Spears Manufacturing Co. were sold together with CPVC pipes as the LABWASTE™ System. Therefore, no LABWASTE™ System CPVC DWV fittings were sold by Spears prior to Spears' receipt of the CPVC pipes ordered in Purchase Order No. 0136012.

4. Further, attached hereto as Exhibit 2 is a copy of Spears' Purchase Order No. C0128154, dated May 3, 2002, which is the purchase order placed for the first brochure advertising the LABWASTE™ System and for the artwork for this brochure. No product advertising or offer for sale of the LABWASTE™ System occurred prior to this date.

5. Exhibits 3-5 attached hereto demonstrate the piping industry's understanding of the suitability of CPVC piping for transporting a variety of chemical agents. Exhibit 3 is a copy of a report concerning the suitability of several types of thermoplastic piping, including CPVC, with a variety of chemical agents. This report (available online at <http://www.plasticpipe.org/pdf/pubs/reports/t19-00.pdf>) was prepared by the Plastics Pipe Institute Inc. (PPI), a trade association representing all segments of the plastics piping industry. The report, dated January 2000, indicates that CPVC is not resistant to many solvents and corrosive chemicals.

6. Attached hereto as Exhibit 4 is a copy of a current brochure from Corzan Industrial Systems, a manufacturer of CPVC pipes and fittings, listing chemical resistance data for its CPVC piping products. This brochure is available online at <http://www.corzancpvc.com/Brochures/ChemResistDataBrochure.pdf>. Table I of this brochure indicates that CPVC pipe is not recommended for use with many chemicals (indicated with an "N" in the table).

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7. Attached hereto as Exhibit 5 is a copy of a current brochure from Georgia Gulf Chemicals & Vinyls, LLC, also a manufacturer of CPVC pipe. Table 2 of this brochure likewise indicates that its ProTherm CPVC pipe is not recommended for use with many chemicals (indicated by "NR" in the table).

8. The PPI report and the Corzan and Georgia Gulf brochures reflect the industry's belief, both prior to the present invention and continuing to the present day, that CPVC piping is not compatible for use with many corrosive chemicals. As a result, prior to the present invention, CPVC fittings and pipes were not used to drain waste from laboratories and other settings where a variety of corrosive chemicals needed to be drained. CPVC piping was instead used only to conduct particular, identified chemical compounds in pressure piping applications.

9. Further evidence of the industry's belief, at the time the present invention was made, that CPVC piping is unsuitable for use in corrosive waste drainage applications can be found in documents issued by companies selling different corrosive waste drainage systems. These documents, attached hereto as Exhibits 6 and 7, have been distributed to customers of waste drainage systems by sales representatives of competitors of Spears Manufacturing Company.

10. Exhibit 6 is a memo dated 9/30/02 and issued by Orion Fittings, Inc. This memo restates the industry's belief that CPVC is not suitable for acid waste applications, in particular in research institutions (see, e.g., paragraph 1 of the memo). It also confirms that at the time the present invention was made CPVC was not listed for corrosive waste applications in any major plumbing code (paragraph 4). Contrary to the assertions made in this memo, our tests of CPVC piping have found that such piping is in fact resistant to the compounds listed in paragraph 1 of this memo when used in drainage applications. CPVC drainage piping has also now been: (1) certified for corrosive waste end use by NSF International in accordance with NSF standard 14; (2) certified for use in accordance with the Uniform Plumbing Code (UPC) by NSF International as specified in IAPMO Interim Guide Criteria IGC 210; and (3) approved for use in accordance with the

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International Plumbing Code (IPC) by the International Codes Council Evaluation Services (ICC-ES), Evaluation Report ESR-1214. The suggestion in paragraph 2 of this memo that soap cannot be drained with CPVC piping is simply untrue.

11. Exhibit 7 is a letter issued by an employee of IPEX, Inc. on November 5, 2002. This letter makes assertions similar to those contained in Exhibit 6, and likewise states that the lower resistance of CPVC to certain chemicals makes it unsuitable for use in acid waste piping systems. The assertion in this letter that CPVC piping cannot withstand detergent drainage is incorrect.

12. Contrary to the understanding and expectations of the piping industry, we have found that CPVC fittings and pipes can in fact be successfully used to drain corrosive chemical compounds. The ability to drain such compounds without compromising the integrity of the CPVC piping is believed to be due at least in part to the fact that DWV fittings and associated pipes are designed to convey waste material through them, so that contact between the corrosive waste and the CPVC piping is limited. DWV fittings accomplish this through the use of sockets and/or bores which are pitched to "fall" or decline by at least about 1/4" per foot.

13. The wide variety of chemical compounds which can be drained with CPVC DWV fittings and pipe is set out in Spears Manufacturing Company's Technical Information & Installation Guide (Document No. LW-4-1205) for the LabWaste CPVC Corrosive Waste Drainage System. Pages 29-32 of this document, attached hereto as Exhibit 8, show chemical resistance tables for CPVC DWV fittings and pipe in drainage applications. The full document can be found online at <http://www.plasticpipe.org/pdf/pubs/reports/tr19-00.pdf>.

14. A partial list of corrosive chemicals which are not recommended for use with CPVC fittings and pipes by the PPI, Corzan Industrial Systems, and Georgia Gulf documents (Exhibits 3-5) but which have been found to be compatible when used with fittings and pipes made from CPVC in DWV applications is attached as Exhibit 9 hereto.

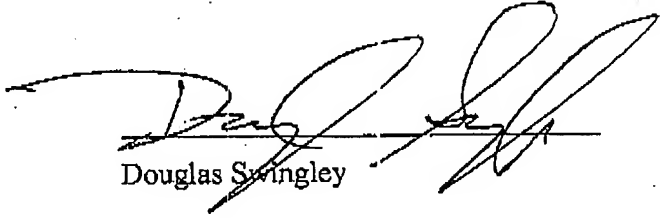
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broad range of chemicals with which CPVC is compatible in DWV applications makes CPVC DWV fittings and pipes suitable for use in draining corrosive chemical waste.

I declare under penalty of perjury that the foregoing is true and correct, and that if called to testify thereto, I could and would so testify. All of the data provided and any statements made in this declaration are believed to be true. I further declare that I understand that willful false statements and the like are punishable by fine or imprisonment or both (18 U.S.A. § 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Executed this 13 day of March, 2006, at SYLMAR, California.


Douglas Swingley

BLAKE PUR062S SPEARS MANUFACTURING COMPANY 2/13/06
QPADEV008N DISPLAY P.O. HISTORY HEADER RECORD DISPLAY 14:42:53

ORDER NUMBER : 0136012 RELEASE DATE : 8/30/02 CREATION DATE : 8/30/02
BUYER : [REDACTED] DEPARTMENT CODE : PUR
VENDOR : [REDACTED] PH# : [REDACTED]
CONTACT : [REDACTED] VENDOR TERM : 2% 30 NET 30 DAYS
BILL TO : C SHIP TO : C
SPEARS MANUFACTURING (CANEY) SPEARS MANUFACTURING (CANEY)
(620) 879-2131 (620) 879-2131
RURAL ROUTE 1
CANEY
KS 67333 0000 KS 67333 0000
PREVIOUS STATUS : SHIP TO OVERRIDE CODE : N CLOSE TYPE : N

FOB CODE : CARRIER V1 VENDOR DELIVERY
TAX CODE : Z N/A FRT CODE B PREPAID/CHARGED
REQUESTER : [REDACTED]
APPROVAL : DOUG DOUG SWINGLEY APPROVED DATE 8/30/02
PURPOSE : Doug
P.O. CURRENCY RATE : 1.0000 UP TO DATE CURR. RATE : 1.0000
LAST DATE MAINTAINED : 10/10/02 USER LAST MAINTENANCE : [REDACTED]
F3=Exit F15=Vendor Override F17=Item Detail

PUR063S SPEARS MANUFACTURING COMPANY 2/13/06
 QPADEV008N P.O. HISTORY DETAIL BY ORDER DISPLAY 14:43:24
 VENDOR: ORDER NO.: 0136012
 PART NUMBER DUE DATE

Type options, press Enter.

5=View P.O. Detail Record

8=View Receiving Detail

N=Detail Note

9=View Detail Comments

?	PART NUMBER	DUE DATE	P/O W REL H	QTY ORDERED	QTY OPEN	QTY RECEIVED	UNIT COST
-	LW-015	9/13/02	1 C		0		
	PART DESC : 1-1/2 CPVC LABWASTE PIPE (10 FT LENGTH)						
-	LW-020	9/13/02	2 C		0		
	PART DESC : 2 CPVC LABWASTE PIPE (10 FT LENGTH)						
-	LW-030	9/13/02	3 C		0		
	PART DESC : 3 CPVC LABWASTE PIPE (10 FT LENGTH)						
-	LW-040	9/13/02	4 C		0		
	PART DESC : 4 CPVC LABWASTE PIPE (10 FT LENGTH)						
-	LW-060	9/13/02	5 C		0		
	PART DESC : 6 CPVC LABWASTE PIPE (10 FT LENGTH)						

F3=Exit

TO : SPEARS MANUFACTURING (CANEY)
P.O. BOX 9203
15853 OLDEN STREET
SYLMAR, CA 91342
ATTN : ACCOUNTS PAYABLE

PURCHASE ORDER

P.O.#C0128154 - 1
ORDER DATE: 5/03/02
DATE REQUIRED:

VENDOR NO.

VENDOR
NAME

SPEARS MANUFACTURING (CANEY)
(620) 879-2131
RURAL ROUTE 1
CANEY, KS 67333

SHIP
TO

CONFIRM TO		TERMS	REFERENCE	SHIP VIA		
BUYER		REQUESTED BY	JOB	FREIGHT TERMS		
NDY TAPIA		FELIPE NIEVES		VENDOR DELIVERY		
QTY ORDERED	ITEM NUMBER	DESCRIPTION	DUE DATE	UNIT COST	UNIT TAXABLE	EXTENSION
11	FILM CHARGES	NEW ARTWORK FOR: LW-2	5/06/02		EA N	
12	LW-2	LABWASTE BROCH 0603 COATED, BOOK 6 PAGES, 4/COLOR,	5/03/02		EA N	
				TAX.		01
				TOTAL.		01

** END OF ORDER **

PURPOSE: new item,

VENDOR NOTE

This Company reserves the right to cancel this order if not delivered as specified. Do not substitute any item without the Company's approval. If pricing will not as shown, notify the Company immediately before filling order. Invoices received

TR-19/2000
Thermoplastics Piping
for the
Transport of Chemicals

THERMOPLASTIC PIPING FOR THE TRANSPORT OF CHEMICALS

Foreword

This report was developed and published with the technical help and financial support of the members of the PPI (Plastics Pipe Institute, Inc.). The members have shown their interest in quality products by assisting independent standards-making and user organizations in the development of standards, and also by developing reports on an industry-wide basis to help engineers, code officials, specifying groups, and users.

The purpose of this technical report is to provide information on the transport of various chemicals using thermoplastic piping materials.

This report has been prepared by PPI as a service of the industry. The information in this report is offered in good faith and believed to be accurate at the time of its preparation, but is offered without any warranty, expressed or implied, including WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Consult the manufacturer for more detailed information about the particular weathering package used for its piping products. Any reference to or testing of a particular proprietary product should not be construed as an endorsement by PPI, which do not endorse the proprietary products or processes of any manufacturer. The information in this report is offered for consideration by industry members in fulfilling their own compliance responsibilities. PPI assumes no responsibility for compliance with applicable laws and regulations.

PPI intends to revise this report from time to time, in response to comments and suggestions from users of the report. Please send suggestions of improvements to the address below. Information on other publications can be obtained by contacting PPI directly or visiting the web site.

The Plastics Pipe Institute
Toll Free: (888) 314-6774
<http://www.plasticpipe.org>

January 2000

CHEMICAL RESISTANCE IN GENERAL

Thermoplastic materials generally are resistant to attack from many chemicals which makes them suitable for use in many process applications. The suitability for use in a particular process piping application is a function of:

I. Material

- A. The specific plastic material: ABS, CPVC, PP, PVC, PE, PB, PVDF, PEX¹, PA11, PK
- B. The specific plastic material and its physical properties as identified by its cell classification according to the appropriate ASTM material specification.

II. Product and Joint System

- A. Piping product dimensions, construction, and composition (layers, fillers, etc.).
- B. Joining system. Heat fusion and solvent cementing do not introduce different materials into the system. Mechanical joints can introduce gaskets such as elastomers, or other thermoplastic or non-thermoplastic materials used as mechanical fitting components.
- C. Other components and appurtenances in the piping system.

III. Use Conditions - Internal and External

- A. Chemical or mixtures of chemicals, and their concentrations.
- B. Operating temperature — maximum, minimum, and cyclical variations.
- C. Operating pressure or applied stress — maximum, minimum and cyclical variations.
- D. Life-cycle information — such as material cost, installation cost, desired service life, maintenance, repair and replacement costs, etc.

While the effect of each individual chemical is specific, some chemicals can be grouped into categories based on similar reactions. For example, water solutions of neutral inorganic salts generally have the same effect on thermoplastic piping materials as water alone, thus, sodium chloride, potassium alum, calcium chloride, copper sulfate, potassium sulfate and zinc chloride solutions have the same effect as water. However, at elevated temperatures and/or high concentrations, some oxidizing salt solutions may attack some specific plastic materials.

Further, with organic chemicals in a specific series such as alcohols, ketones, or acids, etc., as the molecular weight of the organic chemical series increases, the chemical resistance of a particular plastic material to members of the specific organic chemical series frequently also increases. Thus, while one type of

¹ Once cross-linked, PEX is no longer considered a thermoplastic material; however, it is included in this report as convenience for the reader.

polyvinyl chloride at 73 °F is not suitable for use with ethyl acetate, it is suitable for the higher molecular weight butyl acetate.

Generally, the resistance of a particular plastic to a specific chemical decreases with an increase in concentration. For example, at 73 °F polyethylene pipe can be used to carry 70% sulfuric acid but is not satisfactory for 95% sulfuric acid. In some cases, combinations of chemicals may have a synergistic effect on a thermoplastic material where individual chemicals do not. Lastly, the resistance of a particular plastic to a specific chemical generally decreases with temperature increase, with stress increase, and decreases with cyclical variations of temperature or applied stress.

TYPES OF CHEMICAL ATTACK ON PLASTICS

In general, chemicals that affect plastics do so in one of two ways. One effect is chemical solubility or permeation. The other is direct chemical attack.

In the case of solubility or permeation, physical properties may be affected, but the polymer molecule structure itself is not chemically changed, degraded or destroyed. In solubility or permeation, gas, vapor, or liquid molecules pass through the polymer, typically without damaging the plastic material itself. If the solvating chemical can be removed completely, the plastic is generally restored to its original condition. However, it is not always possible to remove a solvating chemical from the plastic, and in such cases, effects relating to chemical solvation may be permanent.

Sometimes the polymer itself may not be soluble, but it may contain a compounding ingredient that may be soluble in the chemical, and may be extracted from the polymer compound. This is rare because such extractable ingredients are either not used in pipe compounds, or they are chemically bonded to the molecular polymer matrix, and in such small amounts that they cannot be leached out to any significant extent.

Permeation may do little if any harm to the material, but it may have application-related effects. The permeating chemical may transfer into a fluid on the other side of the pipe. In general, thermoplastic pipes should not be used where a permeating chemical could compromise the purity of a fluid such as potable water inside the pipe, and in gas or vapor transmission service, there may be a very slight loss of contents through the pipe wall. Lastly, a permeating chemical may be entrained in the material and be released when heat fusion or solvent cement joining is performed. Heat fusion or solvent cement joining may be unreliable if performed on permeated pipes.

Direct chemical attack occurs when exposure to a chemical causes a chemical alteration of the polymer molecules by chain scission, crosslinking, oxidation, or substitution reactions. Direct chemical attack may cause profound, irreversible changes that cannot be restored by removal of the chemical. Examples of this

type of attack are 50% chromic acid at 140 °F on PVC, aqua regia on PVC at 73 °F, 95% sulfuric acid at 73 °F on PE and wet chlorine gas on PVC and PE. Direct chemical attack frequently causes a severe reduction of mechanical physical properties such as tensile strength, ductility, and impact resistance, and susceptibility to cracking from applied stress (stress cracking).

However, direct chemical attack is not always detrimental. For example, PEX materials are deliberately crosslinked using chemical or irradiation methods. While crosslinking enhances certain mechanical properties of PEX materials, it may preclude the use of heat fusion to join PEX piping.

The chemical resistance of the various plastic types varies greatly from one plastic material to another (i.e., PVC, ABS, PE, etc.), and also among different cell classifications of the same plastic type (e.g. PVC 1120 to PVC 2110, PE 1404 to PE 3408, etc.). There may also be slight variations among commercial products having the same cell classification.

The chemical resistance of plastic piping is basically a function of the chemical resistance of the thermoplastic material, and processing of the plastic in such a way that its full chemical resistance is developed. In general, the less compounding ingredients used the better the chemical resistance. Most plastic pipe compounds covered by current ASTM specifications and product standards use a minimum of compounding ingredients, except for the Type II PVC's and CAB plastics. The Type II PVC's contain impact modifiers which are less susceptible to chemical attack than monomeric plasticizers such as those used in PVC cable insulation, film and sheeting compounds, and in CAB plastics. Thermoplastic pipes with significant filler percentages may be susceptible to chemical attack where an unfilled material may be affected to a lesser degree or not at all.

Some newer piping products utilize a multi-layered (composite) construction, that is, the pipe wall is constructed of layers of different materials. Both thermoplastic and non-thermoplastic materials are used for the layers. Examples are PE/AL/PE, and PEX/AL/PEX pipes where there is a mid-wall aluminum layer. An all thermoplastic composite pipe has PVC, ABS, and PVC layers. Layered composite material pipes may have chemical resistance that differs from the chemical resistance of the individual materials.

Chemicals that attack plastics do so at a certain rate, some slowly and some more quickly. But usually, any chemical attack is increased when temperature or stress are increased, or when temperature or stress are varied. The particular rate must be taken into consideration in the life-cycle evaluation for a particular application. It has been observed in some chemical plants that while a particular application may have a relatively short service life, the overall life-cycle cost may be economically feasible and justifiable. Each combination of material cost, installation cost and service life must be evaluated and judged on its own merits.

CHEMICAL RESISTANCE DATA FOR THERMOPLASTIC PIPING IN NON-PRESSURE (GRAVITY-FLOW) APPLICATIONS and DATA TABLE

When thermoplastic pipes come into contact with chemical agents, it is important to know how the pipe may be affected. For gravity flow or non-pressure applications, where the pipe is not subject to continuous internal pressure or thermal stress, chemical immersion test data may provide suitable information. The pipe manufacturer may have additional information on similar testing, or information on previous installations under similar field conditions.

I. A thermoplastic pipe that is subjected to several chemicals may or may not be affected by the chemical combination. Chemicals that individually do not have an effect may affect the pipe if combined with certain other chemicals. The listings that follow do not address chemical combinations.

II. Layered composite piping may have chemical resistance that differs from that of the individual materials in the layers. The listings that follow are not applicable to layered composite piping products.

III. The listings that follow are not applicable to composite piping products such as reinforced epoxy resin (fiberglass) pipes, or to thermoplastic pipes containing significant percentages of filler materials.

IV. The following chemical resistance information has been obtained from numerous sources. It is based primarily on plastic material test specimens that have been immersed in the chemical, and to a lesser degree, on field-experience. In most cases, detailed information on the test conditions (such as exposure time), and on test results (such as change in weight, change in volume, and change in strength) were not available. Therefore, this information is best used only for comparison of different thermoplastic materials.

V. Where no concentrations are given, the relatively pure material is indicated, except in the case of solids where saturated aqueous solutions are indicated.

NOTE: *Even though indicated as acceptable with certain temperature limitations, the use of PVC piping with liquid hydrocarbons such as gasoline and jet fuels, should be limited to short-term exposure such as secondary containment systems. This piping is not recommended for long-term exposure to liquid hydrocarbons.*

Resistance Codes

The following code is used in the data table:

<u>Code</u>	<u>Meaning</u>	<u>Typical Result</u>
140	Plastic type is generally resistant to temperature (°F) indicated by code.	Swelling < 3% or weight loss < 0.5% and elongation at break not significantly changed.
R to 73	Plastic type is generally resistant to temperature (°F) indicated by code and may have limited resistance at higher temperatures.	Swelling < 3% or weight loss < 0.5% and elongation at break not significantly changed.
C to 73	Plastic type has limited resistance to temperature (°F) indicated by code and may be suitable for some conditions.	Swelling 3-8% or weight loss 0.5-5% and/or elongation at break decreased by < 50%.
N	Plastic type is not resistant.	Swelling > 8% or weight loss > 5% and/or elongation at break decreased by > 50%.
—	Data not available.	

Plastic Materials Identification

ABS	acrylonitrile-butadiene-styrene
CPVC	chlorinated polyvinyl chloride
PP	polypropylene
PVC	polyvinyl chloride
PE	polyethylene
PB	polybutylene
PVDF	poly vinylidene fluoride
PEX	crosslinked polyethylene
PA11	polyamide 11
PK	polyketone

CHEMICALS THAT DO NOT NORMALLY AFFECT THE PROPERTIES OF AN UNSTRESSED THERMOPLASTIC MAY CAUSE COMPLETELY DIFFERENT BEHAVIOR (SUCH AS STRESS CRACKING) WHEN UNDER THERMAL OR MECHANICAL STRESS (SUCH AS CONSTANT INTERNAL PRESSURE OR FREQUENT THERMAL OR MECHANICAL STRESS CYCLES). UNSTRESSED IMMERSION TEST CHEMICAL RESISTANCE INFORMATION IS APPLICABLE ONLY WHEN THE THERMOPLASTIC PIPE WILL NOT BE SUBJECT TO MECHANICAL OR THERMAL STRESS THAT IS CONSTANT OR CYCLES FREQUENTLY.

WHEN THE PIPE WILL BE SUBJECT TO A CONTINUOUS APPLIED MECHANICAL OR THERMAL STRESS OR TO COMBINATIONS OF CHEMICALS, TESTING THAT DUPLICATES THE EXPECTED FIELD CONDITIONS AS CLOSELY AS POSSIBLE SHOULD BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE PIPE PRODUCT TO PROPERLY EVALUATE PLASTIC PIPE FOR USE IN THIS APPLICATION.

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Acetaldehyde CH_3CHO		---	N	140	N	C to 73	C to 73	---	C to 140	C to 176	R to 73
	Aq. Of 40%	---	N	---	C to 73	R to 73	---	N	R to 73	---	---
Acetamide CH_3CONH_2	5%	120	---	140	---	140	---	---	140	---	---
Acetic Acid CH_3COOH	vapor	120	180	180	140	140	140	---	140	---	---
	5%	---	---	---	---	---	---	---	---	---	R to 176
	10%	---	---	---	---	---	---	R to 248	140	R to 176	---
	25%	N	180	180	140	140	140	---	140	---	---
	40%	---	---	---	---	---	---	R to 140	R to 176	---	---
	50%	---	---	---	---	---	---	R to 140	R to 176	C to 68	---
	60%	N	N	180	73	73	73	R to 104	73	---	---
	80%	---	---	---	---	---	---	R to 104	---	---	---
	85%	N	N	120	73	73	73	---	73	---	---
	glacial	N	N	120	73	73	73	R to 104	R to 68	---	---
Acetic Anhydride $(\text{CH}_3\text{CO})_2\text{O}$	---	N	N	73	N	73	140	N	73	C to 68	---
Acetone	5%	N	N	73	N	C to	140	R to	C to	C to	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
CH ₃ COCH ₃						73		212	73	140	
	10%	---	---	---	---	---	---	R to 122	---	---	---
	100%	---	---	---	---	---	---	---	---	---	R to 73 C to 122
Acetophenone C ₆ H ₅ COCH ₃	---	N	---	120	--	73	---	R to	73 68	---	---
Acetyl Chloride CH ₃ COCl	---	N	N	---	N	---	---	N	---	---	---
Acetylene HC=CH	gas 100%	73	N	73	N	73	C to 73	---	73	140	---
Acetonitrile	---	---	N	---	N	---	---	---	---	---	---
Acrylic Acid H ₂ C:CHCOOH	97%	---	N	---	N	140	---	---	140	---	---
Acrylonitrile H ₂ C:CHCN	---	---	N	---	N	140	---	---	140	---	---
Adipic Acid COOH(CH ₂) ₄ COOH	sat'd	---	180	140	140	140	73	R to 176	140	---	---
Allyl Alcohol CH ₂ = CHCH ₂ OH	96%	---	C to 73	140	R to 73	140	140	---	N	---	---
	--	---	N	---	N	C to	---	140	C to	---	---
CH ₂ Cl					73				73		
	Liquid	---	---	---	---	---	---	R to 68	---	---	---
Aluminum Ammonium	sat'd	---	180	140	140	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sulfate (Alum) $\text{Al}(\text{NH}_4)(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$											
Aluminum Chloride Aqueous AlCl_3	sat'd	160	180	180	140	140	140	R to 212	140	---	---
Aluminum Fluoride Anhydrous AlF_3	sat'd	160	180	180	73	140	140	R to 212	140	---	---
Aluminum Hydroxide $\text{Al}(\text{OH})_3$	sat'd	160	180	180	140	140	140	R to 212	140	---	N
Aluminum Nitrate $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$	sat'd	---	180	180	140	140	140	R to 212	140	---	---
Aluminum Oxychloride	--	---	180	180	140	---	140	---	---	---	---
Aluminum Potassium Sulfate (Alum) $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	sat'd	160	180	140	140	140	---	R to 212	140	---	---
Aluminum Sulfate (Alum) $\text{Al}_2(\text{SO}_4)_3$	sat'd 20%	160 ---	180 ---	140 ---	140 ---	140 ---	C to 73 ---	R to 212 ---	140 ---	194 ---	---
Amonia Gas NH_3	100%	N	N	140	140	140	140	---	140	140	---
Amonia Liquid NH_3	100%	160	N	140	N	140	73	---	140	140	---
Amonia Acetate $\text{NH}_4(\text{C}_2\text{H}_3\text{O}_2)$	sat'd	120	180	73	140	140	---	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Amonium Bifluoride NH ₄ HF ₂	sat'd	---	180	180	140	---	140	---	140	---	---
Amonium Bisulfide (NH ₄)HS	---	---	---	---	140	---	---	---	---	---	---
Amonium Carbonate (NH ₄)HCO ₃ O (NH ₄) CO ₂ NH ₂	sat'd	---	180	212	140	140	140	R to 248	140	---	---
Amonium Chloride NH ₄ Cl	sat'd	120	180	212	140	140	140	R to 212	140	---	---
Amonium Dichromate -- (NH ₄) ₂ Cr ₂ O ₇	---	---	73	---	73	---	---	---	---	---	---
Amonium Fluoride NH ₄ F	10%	120	180	212	140	140	---	R to 212	140	---	---
	25%	120	180	212	C to 140	140	73	---	140	---	---
Amonium Hydroxide NH ₄ OH	10%	120	N	212	140	140	140	---	140	---	N
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
	Conc.	---	---	---	---	---	---	---	194	---	---
Amonium sphate	Sat'd	--	-- 212	R to 140	R to 140	R to 140	R to 248	R to	R to 140	---	---
Amonium Nitrate NH ₄ NO ₃	sat'd	120	180	212	140	140	140	R to 212	140	---	---
Amonium Persulphate (NH ₄) ₂ S ₂ O ₈	---	---	---	180	140	140	140	140	R to 212	140	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Amonium Phosphate all (Monobasic) $\text{NH}_4 \text{H}_2 \text{PO}_4$		120	180	212	140	140	140	R to 248	140	---	---
Amonium Sulfate (NH_4) ₂ SO ₄	Sat'd.	120	180	212	140	140	140	R to 212	140	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
Amonium Sulfide (NH_4) ₂ S	dilute	120	180	212	140	140	140	---	140	---	---
	Sat'd.	---	---	---	---	140	---	---	---	---	---
Amonium Thiocyanate $\text{NH}_4 \text{SCN}$	50-60%	120	180	212	140	140	140	R to 212	73	---	---
Amyl Acetate $\text{CH}_3 \text{COOC}_5 \text{H}_{11}$	--		N	N	N	N	73	---	R to 122	73 194	C to ---
Amyl Alcohol $\text{C}_5 \text{H}_{11} \text{OH}$	--	---	N	---	N	140	140	R to 212	R to 140	---	---
	100%	---	---	---	---	---	C to 140	---	---	---	---
n-Amyl Chloride $\text{CH}_3 (\text{CH}_2)_3 \text{CH}_2 \text{Cl}$	--	N	N	N	N	C to 73	---	---	C to 73	---	---
Anisole		---	---	---	---	---	---	---	---	---	C to 73
Aniline I_2	--	N	N	---	N	73	C to 140	R to 68	C to	---	N 140
Aniline Chlorohydrate	--	---	N	---	N	C to 73	N	---	C to 73	---	---

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Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
Barium Nitrate $\text{Ba}(\text{NO}_3)_2$	sat'd	73	180	140	73	140	---	---	140	---	---
Barium Sulfate BaSO_4	sat'd	73	180	140	140	140	140	R to 212	140	---	---
Barium Sulfide BaS	sat'd	73	180	140	140	140	140	---	R to 248	---	---
Beer	--	120	180	180	140	R to 140	140	R to 248	R to 140	68	R to 73
Beet Sugar Liquors	--	---	180	180	140	73	140	---	73	---	---
Benzaldehyde $\text{C}_6\text{H}_5\text{CHO}$	10%	N	R to 73	73	R to 73	73	C to 73	---	73	R to 104	---
	99%	---	---	---	---	---	---	---	---	---	C to 73
Benzene C_6H_6	--	N	N	N	N	C to 120	N	C to 122	R to 68	---	---
Benzene Sulfonic Acid $\text{C}_6\text{H}_5\text{SO}_3\text{H}$	10%	---	180	180	140	R to 73	---	---	R to 73	---	---
	10%+	---	N	---	N	---	---	---	---	---	---
Benzoic Acid $\text{C}_6\text{H}_5\text{COOH}$	all	160	180	73	140	140	140	---	R to 248	---	---
Benzoyl Chloride	Sat. Sol.	---	---	---	---	---	---	C to 68	---	---	---
Benzyl Alcohol $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$	--	---	N	120	N	140	---	R to 122	140	R to 68	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Benzyl Chloride		---	---	---	---	---	---	---	R to 140	---	---
Bismuth Carbonate (BiO) ₂ CO	Sat'd.	---	180	180	140	140	140	---	140	---	---
Black Liquor	sat'd	---	180	140	140	120	140	---	120	---	---
Bleach	5% Active Cl ₂	---	180	120	140	C to 140	---	---	C to 140	---	R to 73
	12% Active Cl ₂	73	185	120	140	73	140	---	73	---	---
Borax Na ₃ B ₄ O ₇ • 10H ₂ O	sat'd	160	180	212	140	140	140	---	140	---	---
Boric Acid H ₃ BO ₃	Sat'd	160	180	212	140	140	140	R to 212	140	---	---
Brake Fluid	--	---	---	140	---	140	---	---	140	---	---
Brine	sat'd	---	180	140	140	140	140	---	140	---	---
Bromic Acid HBrO ₃	Sat'd	---	180	N	140	N	140	R to 212	N	---	---
	10%	---	---	---	---	140	---	---	---	---	---
Bromine Br ₂	Liquid	73	N	N	N	N	N	R to 248	N	N	---
	vapor 25%	---	180	N	140	N	---	---	N	---	---
Bromine Water	cold	---	180	N	140	N	C to	R to	N	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	sat'd						73	176			
Bromobenzene C ₆ H ₅ Br	--	---	---	---	N	---	---	---	---	---	---
Bromotoluene C ₆ H ₅ CH ₂ B ₂	--	---	---	C	N	---	---	---	---	---	---
Butadiene H ₂ C: CHHC: CH ₂	50% Gas	---	180 ---	N ---	140 ---	73 ---	---	---	73 ---	---	---
								R to 212			
Butane C ₄ H ₁₀	50% Gas	---	180 ---	140 ---	140 ---	140 ---	N ---	---	140 ---	---	---
								R to 68			
n-Butanol	Liquid	---	---	---	---	---	---	R to 140	---	---	R to 73
Butyl Acetate CH ₃ COOCH (CH ₃) (C ₂ H ₅)	100%	N	N	C to 73	N	C to 73	C to 73	C to 104	C to 73	R to 194	---
Butyl Alcohol CH ₃ (CH ₂) ₂ CH ₂ OH	--	---	C to 73	180	140	140	140	---	140	C to 104	---
Butyl Cellosolve HOCH ₂ CH ₂ OC ₄ H ₉	--	---	N	---	73	---	---	---	---	---	---
n-Butyl Chloride C ₄ H ₉ Cl	--	N	N	---	---	---	---	---	---	---	---
Butyl Glycol	Liquid	---	---	---	---	---	---	R to 212	---	---	---
Butylene © CH ₃ CH:CHCH ₃	Liquid	---	---	N	140	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Butyl Phenol $C_4H_9C_6H_5OH$	--		---	N	C to 73	73	73	---	R to 176	---	---
Butyl Phthalate	--	---	N	180	---	---	---	R to 140	---	---	---
Butyl Stearate	--	---	---	---	73	---	---	---	---	---	---
Butynediol $HOCH_2C \equiv CCH_2OH$	--	---	---	---	73	---	---	---	---	---	---
Butyric Acid $CH_3CH_2CH_2COOH$	20% Liquid	N --- ---	N --- ---	180 --- ---	73 --- ---	73 --- ---	73 --- ---	--- R to 212 R to 176	73 --- 73	--- --- ---	--- --- ---
Cadmium Cyanide $Cd(CN)_2$	--	---	180	---	140	---	---	---	---	---	---
Calcium Bisulfide $Ca(HS)_2 \cdot 6H_2O$	--	---	73	---	N	140	---	---	140	---	---
Calcium Bisulfite $Ca(HSO_3)_2$	-- Sat'd	--- ---	180 ---	180 ---	140 ---	N ---	140 ---	--- R to 248	N ---	--- ---	--- ---
Calcium Carbonate $CaCO_3$	Sat'd	---	180	180	140	140	140	R to 248	140	---	---
Calcium Chlorate $Ca(ClO_3)_2 \cdot 2H_2O$	--	---	180	180	140	140	140	R to 248	140	---	---
Calcium Chloride $CaCl_2$	5% Sat'd	--- 120	--- 180	--- 180	--- 140	--- 140	--- 140	--- R to 248	--- R to 176	--- R to 194	R to 176 ---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Calcium Hydroxide Ca(OH) ₂	--	160	180	180	140	140	140	---	140	---	---
	2%	---	---	---	---	---	---	---	---	---	R to 73
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
Calcium Hypochlorite Ca(OCl) ₂	30% Sat'd	160 ---	180 ---	140 ---	140 ---	140 ---	140 ---	---	140 ---	---	---
								C to 212			
Calcium Nitrate Ca(NO ₃) ₂	-- 50% Sat'd	--- --- ---	180 --- ---	180 --- ---	140 --- ---	140 140 ---	140 --- ---	---	140 140 ---	---	---
								R to 212			
								R to 176			
Calcium Oxide CaO	--	---	180	---	140	140	---	---	140	---	---
Calcium Sulfate CaSO ₄	--	100	180	180	140	140	140	R to 212	140	---	---
Calcium Hydrogen Sulphide	>10%	---	---	---	---	---	---	R to 248	---	---	---
Camphor C ₁₀ H ₁₆ O	--	N	---	73	73	73	---	---	73	---	---
Cane Sugar Liquors C ₁₂ H ₂₂ O ₁₁	--	---	180	180	140	140	150	---	140	---	---
Carbitol	--	---	N	---	73	---	---	---	---	---	---
Carbon Dioxide	Dry	160	180	140	140	140	---	R to	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
CO ₂	100%							212			
Carbon Dioxide CO ₂	Wet	160	180	140	140	140	140	---	140	---	---
Carbon Disulfide CS ₂	--	N	N	N	N	C to 140	---	---	R to 68	R to 104	---
Carbon Monoxide CO	Gas	---	180	180	140	140	140	R to 140	140	---	---
Carbon Tetrachloride CCl ₄	--	N	N	N	73	C to 73	N	C to 212	C to 68	N	R to 73
Carbonic Acid H ₂ CO ₃	Sat'd ---	185	180	140	140	140	---	---	140	---	---
Castor Oil	--	---	C to 180	140	140	73	140	---	73	---	---
Caustic Potash KOH	50%	160	180	180	140	140	73	---	140	---	---
Caustic Soda NaOH (Sodium Hydroxide)	40%	160	180	180	140	140	73	---	140	---	---
Cellosolve ClCH ₂ COOH	--	---	N	73	73	C to 120	140	---	C to 120	---	---
Cellosolve Acetate CH ₃ COOCH ₂ CH ₂ OC ₂ H ₅	--	---	N	73	73	---	---	---	---	---	---
Chloral Hydrate CCL ₃ CH (OH) ₂	All	---	180	C to 73	140	120	140	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Chloramine $\text{NH}_2 \text{ Cl}$	Dilute	---	N	73	73	73	---	---	73	---	---
Chloric Acid $\text{HClO}_3 \text{ o}7\text{H}_2 \text{ O}$	10%	---	180	73	140	73	---	---	73	---	---
	20%	---	185	73	140	73	---	---	73	---	---
Chlorine Gas (Moisture Content)	0-20 PPM	N	C to 73	N	C to 73	C to 73	---	R to 212	C to 73	---	---
	20-50 PPM	N	N	N	N	C to 73	---	---	C to 73	---	---
	50+ PPM	N	N	N	N	C to 73	---	N	C to 73	---	---
Chlorine	Liquid	N	N	N	N	N	---	---	N	---	N
Chlorinated Water	10 PPM	---	180	180	140	140	140	---	140	---	---
Chlorinated Water	Sat'd	---	180	180	140	C to 120	140	R to 212	C to 120	---	---
Chloroacetic Acid $\text{CH}_2 \text{ ClCOOH}$	50%	N	180	C to	140 73	120	N	---	120	---	---
	>10%	---	---	---	---	---	---	R to 140	---	---	---
Chloroacetyl Chloride -- $\text{ClCH}_2 \text{ COCl}$		---	---	---	73	---	---	---	---	---	---
Chlorobenzene $\text{C}_6 \text{ H}_5 \text{ Cl}$	Dry	N	N	73	N	C to 75	N	---	C to 75	---	---
	Liquid	---	---	---	---	---	---	R to 140	R to 68	C to 176	---
Chlorobenzyl Chloride-- $\text{ClC}_6 \text{ H}_4 \text{ CH}_2 \text{ Cl}$		---	N	---	N	C to 120	---	---	C to 120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Chloroethanol	Liquid		---	---	---	---	---	N 122	R to	---	---
Chloroform CHCl ₃	Dry	N	N	N	N	C to 75	C to 73	---	C to 75	---	---
	Liquid	---	---	---	---	---	---	R to 212	N	---	C to 73
Chloromethane	Gas	---	---	---	---	---	---	R to 212	---	---	---
Chloropicrin CCl ₃ NO ₂	--	---	---	---	N	73	---	---	73	---	---
Chlorosulfonic Acid ClSO ₂ OH	--	---	73	N	73	C to 120	N	---	C to 120	---	---
	50%	---	---	---	---	---	---	R to 68	---	---	---
	100%	---	---	---	---	N	---	---	N	---	---
Chromic Acid H ₂ CrO ₄	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
	10%	73	180	140	140	73	140	R to 212	73	N	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	25%	---	---	---	---	---	---	R to 212	---	---	---
	30%	N	180	73	140	73	140	R to 212	73	---	---
	40%	N	180	73	140	73	73	R to 212	73	---	---
	50%	N	C to 140	73	N	73	N	R to 212	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Chromium	>10%	---	---	---	---	---	---	R to 212	---	---	---
Potassium Sulfate											
$\text{CrK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	--	-	--	73	---	73	---	---	73	---	---
	Sat'd	---	---	---	---	---	R to 212	---	---	---	---
Citric Acid	Sat'd	160	180	140	140	140	140	R to 248	140	C to 140	---
$\text{C}_6\text{H}_8\text{O}_7$											
Coconut Oil	--	---	C to 180	73	140	73	140	R to 248	73	---	---
Cod Liver Oil	Work Sol.	---	---	---	---	---	---	R to 248	---	---	---
Coffee	--	---	180	140	140	140	---	---	140	---	---
Coke Oven Gas	--	---	---	73	140	140	---	---	140	---	---
Copper Acetate	Sat'd	---	73	73	73	---	---	---	---	---	---
$\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$											
Copper Carbonate	Sat'd	---	180	---	140	140	---	---	140	---	---
CuCO_3											
Copper Chloride	Sat'd	73	180	140	140	140	140	---	140	---	---
CuCl_2											
Copper Cyanide	Sat'd	---	180	---	140	140	140	R to 212	140	---	---
$\text{Cu}(\text{CN})_2$											
Copper Fluoride	2%	---	180	73	140	140	140	---	140	---	---
$\text{CuF}_2 \cdot 2\text{H}_2\text{O}$											
Copper Nitrate	30%	---	180	140	140	140	140	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Cu(NO ₃) ₂ · 3H ₂ O	50%	---	---	---	---	---	---	R to 212	---	---	---
Copper Sulfate CuSO ₄ · 5H ₂ O	Sat'd	120	180	120	140	140	140	R to 212	140	R to 194	---
Corn Oil	--	---	C to 180	73	140	120	---	---	120	---	---
Corn Syrup	--	---	185	140	140	140	---	---	140	---	---
Cottonseed Oil	--	120	C to 180	140	140	R to 140	140	---	R to 140	---	---
Creosote	--	---	N	73	N	140	---	---	140	---	---
Cresol CH ₃ C ₆ H ₄ OH	90%	N	N	R to 73	N	73	N	R to 68	73	---	---
Cresylic Acid	50%	---	180	---	140	C to 73	N	---	C to 73	---	---
Croton Aldehyde CH ₃ CH:CHCHO	--	---	N	C to 73	N	---	---	---	---	---	---
	Liquid	---	---	---	---	---	---	R to 104	---	---	---
Crude Oil	--	---	C to 180	140	140	C to 120	C to 73	R to 212	C to 120	R to 140	---
Cupric Chloride	20%	---	---	---	---	---	---	---	---	---	R to 73
Cupric Fluoride CuF ₂	--	---	180	---	140	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Cupric Sulfate $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	Sat'd	100	180	73	140	140	---	---	---	---	---
Cuprous Chloride CuCl	Sat'd	70	180	---	140	140	---	---	140	---	---
Cyclohexane C_6H_{12}	--	73	N	N	N	N	---	R to 248	N	C to 140	---
Cyclohexanol $\text{C}_6\text{H}_{11}\text{OH}$	--	C to 120	N	140	N	73	C to 73	R to 104	73	---	---
Cyclohexanone $\text{C}_6\text{H}_{10}\text{O}$	-- Liquid	N	N	73	N	120	N	N	C to 176	C to 140	---
Detergents (Heavy Duty)	--	---	C to 180	180	140	R to 140	---	---	R to 140	---	R to 73
Dextrin (Starch Gum)	Sat'd	---	180	140	140	140	140	---	140	---	---
Dextrose	Sat'd	---	180	140	140	140	140	---	140	---	---
Diacetone Alcohol $\text{CH}_3\text{COCH}_2\text{C}(\text{CH}_3)_2\text{OH}$	--	---	N	120	N	---	---	---	---	C to 140	---
Dibutoxyethyl Phthalate $\text{C}_6\text{H}_4(\text{COOOC}_2\text{H}_5)_2$	--	---	---	N	---	N	---	---	---	---	---
n-Dibutyl Ether $\text{C}_4\text{H}_9\text{OC}_4\text{H}_9$	--	---	---	---	---	73	---	---	73	---	---
Dibutyl Phthalate $\text{C}_6\text{H}_4(\text{COOC}_4\text{H}_9)_2$	--	N	N	73	N	73	---	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Dibutyl Sebacate $C_4 H_9 OCO (CH_2)_8 OCOC_4 H_9$	--	---	---	73	73	73	---	---	73	---	---
Dichloroacetic Acid	50%	---	---	---	---	---	---	R to 176	---	---	---
Dichlorobenzene $C_6 H_4 Cl_2$	--	N	N	C to 73	N	C to 120	---	---	C to 120	---	R to 73
	Liquid	---	---	---	---	---	---	R to 140	---	---	---
Dichloroethylene $C_2 H_2 Cl_2$	--	---	N	C to 73	N	C to 120	---	---	C to 120	---	---
	Liquid	---	---	---	---	---	---	R to 248	---	---	---
Diesel Fuels	--	---	C to 180	140	140	73	C to 73	R to 212	73	---	---
Diethanolamine	Solid 20%	---	---	---	---	---	---	N ---	---	---	---
		---	---	---	---	---	---	---	R to 194	---	---
Diethylamine $C_4 H_{10} NH$	--	N	N	---	N	C to 120	N	N	C to 120	---	---
Diethyl Ether $C_4 H_{10} O$	--	N	N	73	73	C to 140	---	---	C to 140	140	---
Diglycolic Acid $O(CH_2 COOH)_2$	Sat'd 10%	---	180	140	140	140	140	---	140	---	---
		---	---	---	---	---	---	R to 140	---	---	---
Dimethylamine $(CH_3)_2 NH$	--	---	---	73	140	73	N	N	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Dimethyl Formamide -- $\text{HCOH}(\text{CH}_3)_2$	Liquid	N	N	180	N	120	---	---	120	---	C to 73
Dimethylhydrazine -- $(\text{CH}_3)_2\text{NNH}_2$		---	---	---	N	---	---	---	N	---	---
Dimethyl Phthalate -- $\text{OOC}_9\text{H}_{19}$		---	N	---	---	C to 73	---	---	C to 73	---	---
Diethyl Phthalate -- $\text{C}_6\text{H}_4(\text{COOC}_8\text{H}_{17})_2$		N	N	C to 73	N	73	C to 73	---	73	140	---
Dioxane -- $\text{O}:(\text{CH}_2)_4:\text{O}$	Liquid	---	N	C to 140	N	140	---	---	140	---	---
Diphenyl Oxide $(\text{C}_6\text{H}_5)_2\text{O}$	Sat'd	---	---	---	---	73	---	---	73	---	---
Disodium Phosphate -- Na_2HPO_4		---	180	140	140	140	140	---	140	---	---
Dishwashing Liquid (Cascade)		---	---	---	---	---	---	---	---	---	R to 73
Dow Therm A		---	---	---	N	---	---	---	---	---	---
Ethanol	40%	---	---	---	---	---	---	R to 68	---	---	---
	95%	---	---	---	---	---	---	R to 122	R to 140	---	---
	Liquid	---	---	---	---	---	---	R to 122	R to 140	---	R to 176
Ether		N	N	C to	N	73	N	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
ROR				73							
Ethyl Acetate $\text{CH}_3 \text{COOC}_2 \text{H}_5$	--	N	N	C to 140	N	73	C to 73	---	73	140	R to 73 C to 176
	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Ethyl Acetoacetate $\text{CH}_3 \text{COCH}_2 \text{COOC}_2 \text{H}_5$	--	N	N	---	N	---	---	---	---	---	---
Ethyl Acrylate $\text{CH}_2 : \text{CHOOC}_2 \text{H}_5$	--	---	N	---	N	---	---	---	---	---	---
Ethyl Alcohol (Ethanol) $\text{C}_2 \text{H}_5 \text{OH}$	--	---	C to 140	140	140	140	140	---	140	C to 104	R to 176
Ethyl Benzene $\text{C}_6 \text{H}_5 \text{C}_2 \text{H}_5$	--	---	---	C to 73	N	C to 73	---	---	---	---	---
Ethyl Chloride $\text{C}_2 \text{H}_5 \text{Cl}$	Dry	---	N	C to 73	N	C to 73	---	---	C to 73	---	---
	Gas	---	---	---	---	---	---	R to 212	---	---	---
Ethyl Chloroacetate $\text{CCH}_2 \text{ClCO}_2 \text{C}_2 \text{H}_5$	--	---	---	---	N	---	---	---	---	---	---
Ethyl Ether $(\text{C}_2 \text{H}_5)_2 \text{O}$	Liquid	---	N	N	N	N	N	R to 122	R to 68	---	---
Ethylene Bromide $\text{BrCH}_2 \text{CH}_2 \text{Br}$	Dry	---	N	---	N	---	N	---	---	---	---
Ethylene Chloride	Dry	N	N	C to	N	C to	---	---	C to	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
$\text{ClCH}_2\text{CH}_2\text{Cl}$				73		140			140		
Ethylene Chlorohydrin--		---	N	73	N	---	N	---	---	---	---
$\text{ClCH}_2\text{CH}_2\text{OH}$	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Ethylene Diamine	--	N	---	73	N	140	---	---	140	---	---
$\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$											
Ethylene Dichloride	Dry	N	N	C to 140	N	C to 73	140	---	C to 73	---	---
$\text{C}_2\text{H}_4\text{Cl}_2$											
Ethylene Glycol	Liquid	73	C to 180	212	140	140	140	R to 212	R to 212	---	C to 176
$\text{CH}_2\text{OHCH}_2\text{OH}$											
Ethylene Oxide	--	---	N	C to 73	N	73	---	---	73	C to 140	---
$\text{CH}_2\text{CH}_2\text{O}$											
2-Ethylhexanol	--	---	---	---	---	73	---	---	73	---	---
$\text{CH}_3(\text{CH}_2)_3\text{CHCH}_2\text{H}_5\text{CH}_2\text{OH}$											
Fatty Acids	--	160	73	120	140	120	150	---	120	194	---
R-COOH											
Ferric Chloride	Sat'd	120	180	140	140	140	150	R to 212	140	---	---
(Aqueous)											
FeCl_3											
Ferric Hydroxide	Sat'd	160	180	140	140	140	---	---	140	---	---
Fe(OH)_3											
Ferric Nitrate	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
$\text{Fe(NO}_3)_3 \cdot 9\text{H}_2\text{O}$											
Ferric Sulfate	--	160	180	140	140	140	140	---	140	---	---
$\text{Fe}_2(\text{SO}_4)_3$	Sat'd	---	---	---	---	---	---	R to	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
								212			
Ferrous Chloride FeCl ₂	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Ferrous Hydroxide Fe(OH) ₂	Sat'd	160	180	140	140	140	---	---	140	---	---
Ferrous Nitrate Fe(NO ₃) ₂	--	160	180	140	140	140	---	---	140	---	---
Ferrous Hydroxide Fe(OH) ₂	Sat'd	160	180	140	140	140	---	---	140	---	---
Ferrous Nitrate Fe(NO ₃) ₂	--	160	180	140	140	140	---	---	140	---	---
Ferrous Sulfate FeSO ₄	--	160	180	140	140	140	140	---	140	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Ferrous Chloride FeCl ₂	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Fish Oil	---	---	180	180	140	140	140	---	140	---	---
Fluoboric Acid HBF ₄	---	73	73	140	140	140	---	---	140	---	---
	Solid	---	---	---	---	---	---	R to 104	---	---	---
Fluorine Gas (Dry) F ₂	100%	---	73	N	73	C to 73	C to 73	---	C to 73	N	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Fluorine Gas (Wet) F ₂	--	N	73	N	73	N	N	---	N	N	---
Fluosilicic Acid H ₂ SiF ₆	25%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	R to 140	140	140	140	---	R to 212	---	---	---
	40%	---	---	---	---	---	---	R to 140	---	---	---
	50%	---	73	73	140	140	140	R to 212	--	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Formaldehyde HCHO	Dilute	160	73	140	140	140	140	R to 176	---	C to 104	---
	35%	160	C to 73	140	140	140	140	---	140	---	---
	37%	160	C to 73	140	140	140	140	R to 212	140	---	---
	50%	---	C to 73	---	140	140	140	---	140	---	---
Formic Acid HCOOH	--	N	C to 73	140	73	140	150	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	R to 140	N	N
	40%	---	---	---	---	---	---	R to 212	R to 140	---	---
	50%	---	---	---	---	---	---	R to 176	R to 140	---	---
	85%	---	---	---	---	---	---	R to 212	---	---	---
	100%	---	---	---	---	140	---	---	140	---	---
Freon 11 CCl ₃ F	100%	N	73	N	140	73	---	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Freon 12	100%	---	73	73	140	73	---	---	73	68	---
CCl ₂ F ₂	Work. Sol.	---	---	---	---	---	---	R to 212	R to 68	---	---
Freon 21	100%	---	---	N	N	C to 120	---	---	C to 120	---	---
CHCl ₂ F											
Freon 22	100%	---	73	73	N	C to 120	---	---	C to 120	68	---
CHClF ₂											
Freon 113	100%	---	---	N	140	73	---	---	73	---	---
C ₂ Cl ₂ F ₃											
Freon 114	100%	---	---	N	140	73	---	---	73	---	---
C ₂ Cl ₂ F ₄											
Fructose	Sat'd	73	180	180	140	140	140	---	140	---	---
C ₆ H ₁₂ O ₆											
Fruit Juice	Work. Sol.	---	---	---	---	---	---	R to 212	---	104	---
Furfural	100%	N	N	N	N	C to 140	---	---	C to 140	C to 140	---
C ₄ H ₃ OCHO											
Gallic Acid	--	---	73	---	140	73	---	---	73	---	---
C ₆ H ₂ (OH) ₃ CO ₂ H ₂ O											
Gasoline, Leaded*	--	N	N	N	140	73	N	---	73	---	---
Gasoline, Unleaded*	--	N	N	N	140	73	N	---	73	---	R to 176
Gasoline (Fuel)		---	---	---	---	---	---	R to 212	---	R to 160	---
Gasohol*	--	N	N	N	140	73	N	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Gasoline, Sour*	--	N	N	N	140	C to 73	N	---	C to 73	---	---
Gelatin	--	---	180	180	140	140	140	---	140	---	---
Glucose	--	120	180	212	140	140	140	---	140	---	---
$C_6H_{12}O_6 \cdot nH_2O$	10%	---	---	---	---	---	---	R to 248	---	---	---
Glue	--	---	---	140	140	140	---	---	140	---	---
Glycerine	--	140	180	212	140	140	140	---	140	---	---
$C_3H_5(OH)_3$	Liquid	---	---	---	---	---	---	R to 248	---	---	---
Glycol	--	---	C to 180	212	140	140	---	---	140	C to 140	---
$OHCH_2CH_2OH$	Sat'd	---	180	73	140	140	---	---	140	---	---
Glycolic Acid	10%	---	---	---	---	---	---	R to 212	---	---	---
$OHCH_2COOH$	30%	---	---	---	---	---	---	R to 140	---	---	---
	65%	---	---	---	---	---	---	R to 212	---	---	---
Glyoxal	--	---	---	---	---	140	---	---	140	---	---
$CHCCHO$											
Grape Sugar	--	---	180	---	140	---	---	---	---	---	---
Grapefruit Juice	Work. Sol.	---	---	---	---	---	---	R to 122	---	---	---
Grease	--	---	---	---	---	---	---	---	---	194	---
Green Liquor	--	160	180	---	140	---	140	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Heptane (Type 1) C ₇ H ₁₆	-- Liquid	73 ---	180 ---	N ---	140 ---	73 ---	N ---	--- R to 212	73 C to 176	--- ---	--- ---
n-Hexane C ₆ H ₁₄	-- Liquid	C ---	73 ---	73 ---	73 ---	--- ---	--- ---	--- R to 176	--- ---	--- ---	--- R to 73
Hexanol, Tertiary Type I CH ₃ (CH ₂) ₄ CH ₂ OH	--	---	180	---	140	140	140	---	140	---	---
Hydraulic Oil (Petroleum)	--	---	---	---	73	73	---	---	73	---	---
Hydrazine H ₂ NNH ₂	--	---	N	73	N	---	---	---	---	---	---
Hydrobromic Acid Hbr	20%	73	73	140	140	140	140	R to 212	140	---	---
	50%	N	---	120	---	140	---	R to 140	140	---	---
	66%	---	---	---	---	---	---	R to 212	---	---	---
Hydrochloric Acid Hcl	1%	---	---	---	---	---	---	---	---	---	R to 176
	10%	C to 120	180	140	140	140	140	R to 212	R to 212	C to 104	N
	20%	---	---	---	---	---	---	R to 212	R to 212	---	---
	30%	C to 73	180	140	140	140	140	R to 212	R to 140	---	---
	Conc.	---	---	---	---	---	---	---	R to 140	---	---

Concentration		ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Acid	--	160	180	73	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 248	---	---	---
	10%	---	---	---	---	---	---	R to 248	---	---	---
Acid	Dilute	73	73	180	73	140	140	R to 212	140	---	---
	30%	N	73	140	73	140	140	---	140	---	---
	40%	---	---	---	---	---	---	R to 212	---	---	---
	50%	N	N	73	73	120	140	R to 212	120	---	---
	60%	---	---	---	---	140	---	R to 140	140	---	---
	70%	---	---	---	---	---	---	R to 212	---	---	---
	100%	N	N	C to 73	N	120	---	---	120	---	---
	Gas	---	---	---	---	---	---	R to 104	---	---	---
Acid	50%	N	140	---	140	140	---	---	140	---	---
	Gas	---	73	140	140	140	140	R to 248	140	194	---
Amide	--	---	---	73	140	---	---	---	---	---	---
Chloride	--	---	C	73	N	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (°F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Hydrogen Peroxide H ₂ O ₂	3%	---	---	---	---	---	---	---	---	---	R to 73
	10%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	---	---	---	---	---	R to 212	---	C to 104	---
	50%	---	180	73	140	140	N	R to	140	---	---
	90%	---	180	C to 73	140	73	N	---	73	---	---
Hydrogen Phosphide (Type I) PH ₃	--	---	73	---	140	140	140	---	140	---	---
Hydrogen Sulfide H ₂ S	Dry	---	180	150	140	140	140	R to 248	140	---	---
	Wet	---	180	---	140	140	---	---	140	---	---
Hydrogen Sulfite H ₂ SO ₃	10%	---	---	---	---	140	---	R to 248	140	---	---
Hydroquinone C ₆ H ₄ (OH) ₂	Sat'd	---	180	---	140	140	140	---	---	140	---
Hydroxylamine Sulfate (NH ₂ OH)oH ₂ SO ₄	--	---	180	---	140	140	---	---	140	---	---
Hypochlorous Acid HOCl	10%	73	180	73	140	140	140	---	140	---	---
	70%	---	---	---	---	---	---	R to 212	---	---	---
Inks	--	---	---	140	---	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Iodine I_2	10%	N	73	73	N	C to 120	N	R to 176	C to 120	---	---
Isobutyl Alcohol $(CH_3)_2CHCH_2OH$	--	C to 73	C to 73	73	---	140	---	---	140	---	---
Isooctane $(CH_3)_3CCH_2CH(CH_3)_2$	--	---	---	C to 73	---	73	---	---	73	---	---
	Liquid	---	---	---	---	---	---	R to 212	---	---	---
Isopropyl Acetate $CH_3COOCH(CH_3)_2$	--	N	N	---	---	73	---	---	73	---	---
Isopropyl Alcohol $(CH_3)_2CHOH$	--	---	C to 180	212	140	140	140	C to 212	140	---	R to 73
Isopropyl Ether $(CH_3)_2CHOCH(CH_3)_2$	--	---	N	C to	N 73	73	---	---	73	---	---
JP-4 Fuel*	--	---	C to 73	C to 73	140	73	---	---	73	---	---
JP-5 Fuel*	--	---	C to 73	C to 73	140	73	---	---	73	---	---
Kerosene*	--	73	73	C to 140	140	C to 140	C to 73	---	C to 140	---	---
Ketchup	--	---	---	---	73	---	---	---	---	---	---
Ketones	--	N	N	C to 73	N	73	---	---	73	---	---
	Work Sol	---	---	---	---	---	---	---	R to 302	---	---
Kraft Liquors	--	73	180	---	140	120	140	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lactic Acid $\text{CH}_3\text{CHOHCOOH}$	10%	---	---	---	---	---	---	R to 140	---	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
	25%	73	180	212	140	140	140	---	140	---	---
	80%	N	C to 180	140	73	140	---	---	140	---	---
	Liquid	---	---	---	---	---	---	R to 212	---	R to 194	---
Lard Oil	--	---	C to 180	---	140	C to 120	73	---	C to 120	---	---
Latex	--	---	---	140	---	140	---	---	140	---	---
Lauric Acid $\text{CH}_3(\text{CH}_2)_{10}\text{COOH}$	--	---	180	140	140	120	---	---	120	---	---
Lauryl Chloride (Type I) $\text{C}_{12}\text{H}_{25}\text{Cl}$	--	---	73	---	140	120	73	R to 248	120	---	---
Lead Acetate $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 3\text{H}_2\text{O}$	Sat'd	---	180	180	140	140	140	R to 212	140	---	---
Lead Chloride PbCl_2	--	---	180	140	140	120	---	---	120	---	---
Lead Nitrate $\text{Pb}(\text{NO}_3)_2$	Sat'd	---	180	140	140	120	---	---	120	---	---
Lead Sulfate PbSO_4	--	---	180	140	140	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lead Tetraethyl		---	---	---	---	---	---	R to 212	---	---	---
Lemon Oil	--	---	N	C to 73	---	---	---	---	---	---	---
Lemon Juice		---	---	---	---	C to 140	---	---	C to 140	---	---
Ligroin	--	---	---	140	---	---	---	---	---	---	---
Lime Slurry	--	---	---	---	---	140	---	---	140	---	---
Lime Sulfur	--	---	73	73	73	120	140	---	120	---	---
Linoleic Acid $\text{CH}_3(\text{CH}_2)_4\text{HC:}$ $\text{CHCH}_2\text{CH:}$ $\text{CH}(\text{CH}_2)_7\text{COOH}$	--	---	180	180	140	---	73	---	---	---	---
Linoleic Oil (Type I)	--	---	---	---	140	---	73	---	---	---	---
Linseed Oil	--	73	C to 180	140	140	R to 73	73	R to 248	R to 73	194	---
Liqueurs	--	---	---	140	140	120	140	---	120	---	---
Lithium Bromide LiBr	--	---	---	140	140	140	---	---	140	---	---
Lithium Chloride LiCl	--	---	---	140	140	120	---	---	120	---	---
Lithium Hydroxide LiOH	--	---	---	140	---	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lubricating Oil (ASTM #1)	--	---	180	C to 140	140	73	140	R to 248	73	---	---
Lubricating Oil (ASTM #2)	--	---	180	C to 140	140	73	140	---	73	---	---
Lubricating Oil (ASTM #3)	--	---	180	C to 140	140	73	140	---	73	---	---
Magnesium Carbonate MgCO ₂	--	120	180	212	140	140	140	R to 212	140	---	---
Magnesium Chloride MgCl ₂	Sat'd	120	180	140	140	140	140	R to 140	140	---	---
	50%	---	---	---	---	---	---	R to 212	---	194	---
Magnesium Citrate MgHC ₆ H ₅ O ₇ o5H ₂ O	--	---	180	---	140	140	---	---	140	---	---
Magnesium Hydroxide Mg(OH) ₂	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Magnesium Nitrate Mg(NO ₃) ₂ o2H ₂ O	--	160	180	212	140	140	140	R to 248	140	---	---
Magnesium Oxide MgO	--	160	---	---	---	---	---	---	---	---	---
Magnesium Sulfate MgSO ₄ o7H ₂ O	--	160	180	212	140	140	140	R to 212	140	---	---
Maleic Acid HOOCCH:CHCOOH	Sat'd	160	180	140	140	140	140	R to 140	140	---	---
	50%	---	---	---	---	---	---	R to	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	10%	---	---	---	---	---	---	212 R to 140	---	---	---
Malic Acid <chem>COOHCH2CH(OH)COOH</chem>	--	---	180	140	140	140	140	---	140	---	---
Manganese Sulfate <chem>MnSO4 o4H2O</chem>	--	---	180	180	140	140	---	---	140	---	---
Margarine	Work. Sol.	---	---	---	---	---	---	R to 248	---	---	---
Mercuric Chloride <chem>HgCl2</chem>	-- Sat'd	---	180	180	140	140	140	---	140	---	---
		--	---	---	---	---	---	R to 212	---	---	---
Mercuric Cyanide <chem>Hg(CN)2</chem>	Sat'd	---	180	140	140	140	140	R to 212	140	---	---
Mercuric Sulfate <chem>HgSO4</chem>	Sat'd	---	180	140	140	140	---	---	140	---	---
Mercurous Nitrate <chem>HgNO3 o2H2O</chem>	Sat'd	---	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
Mercury Hg	Liquid	---	180	140	140	140	140	R to 248	140	194	---
Methane <chem>CH4</chem>	--	N	73	73	140	140	---	---	140	140	---
Methanol (Methyl Alcohol)	--	---	N	180	140	R to 140	140	---	R to 140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
CH ₃ OH	5%	---	---	---	---	---	---	R to 140	---	---	---
	Liquid	---	---	---	---	---	---	C to 176	R to 140	---	R to 176
Methoxyethyl Oleate -- CH ₃ OCH ₂ CH ₂ OOCCH ₂₇ H ₃₃		---	---	---	73	---	---	---	---	---	---
Methyl Acetate -- CH ₃ CO ₂ CH ₃		N	N	140	N	C to	---	---	C to	---	---
							120			120	
Methyl Acrylate -- CH ₂ :CHOOCH ₃	Tech Pure	---	---	---	---	140	---	---	140	---	---
Methyl Amine -- CH ₂ NH ₃		---	N	N	N	---	---	---	---	---	---
Methyl Bromide -- CH ₃ Br		---	N	N	N	C to 73	---	---	C to 73	R to 68	---
Methyl Butyl Ketone	Liquid	---	---	---	---	---	---	C to 122	---	---	---
Methyl Cellosolve -- HOCH ₂ CH ₂ OCH ₃		---	N	73	N	C to 120	---	---	C to 120	---	---
Methyl Chloride -- CH ₃ Cl	Dry	N	N	N	N	C to 120	N	---	C to 120	R to 68	---
Methyl Chloroform -- CH ₃ Ccl		N	N	C to 73	N	C to 120	---	---	C to 120	---	---
Methyl Ethyl Ketone (MEK) CH ₃ COC ₂ H ₅	100%	N	N	73	N	N	73	C to 68	R to 140	C to 140	R to 73 C to 176

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Methyl Isobutyl Carbinol (CH ₃) ₂ CHCH ₂ CH(CH ₃)OH	--	---	N	---	N	---	---	---	---	---	---
Methyl Isobutyl Ketone (CH ₃) ₂ CHCH ₂ COCH ₃	--	N	N	73	N	73	---	---	73	---	---
Methyl Isopropyl Ketone CH ₃ COCH(CH ₃) ₂	--	---	N	---	N	73	---	---	73	---	---
Methyl Methacrylate CH ₂ :C(CH ₃)COOH ₃	--	---	N	---	73	140	---	R to 68	140	---	---
Methyl Sulfate (CH ₃) ₂ SO ₄	---	---	73	C to 73	73	140	---	---	---	68	---
Methylene Bromide CH ₂ Br ₂	--	---	N	N	N	C to 120	---	---	C to 120	---	---
Methylene Chloride CH ₂ Cl ₂	100%	---	N	N	N	N	73	C to 104	N	---	C to 176
Methylene Chloro- bromide CH ₂ ClBr	--	---	N	--	N	---	---	---	---	---	---
Methylene Iodide CH ₂ I ₂	--	---	N	N	N	C to 120	---	---	C to 120	---	---
Methysulfuric Acid CH ₃ HSO ₄	--	---	180	140	140	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Milk	--	160	180	212	140	140	140	R to 212	140	194	---
Mineral Oil	--	73	180	C to 140	140	R to 73	C to 73	R to 212	C to 176	---	---
Molasses	--	---	180	140	140	140	140	---	140	---	---
Monochloroacetic Acid CH_3ClCOOH	50%	---	---	140	140	140	---	---	140	---	---
Monochlorobenzene $\text{C}_6\text{H}_5\text{Cl}$	Tech Pure	---	N	73	N	C to 120	---	---	C to 120	---	---
Monoethanolamine $\text{HOCH}_2\text{CH}_2\text{NH}_2$	--	---	---	---	N	---	---	---	---	---	---
Motor Oil	--	---	180	C to 140	140	R to 140	---	---	R to 140	---	---
Morpholine $\text{C}_4\text{H}_8\text{ONH}$	--	---	---	140	---	140	---	---	140	---	---
Mustard, Aqueous	Work. Sol.	---	---	---	---	---	---	R to 248	---	---	---
N-methyl Pyrrolidone	100%	---	---	---	---	---	---	---	---	---	C to 73
Naphtha	--	---	73	73	140	73	73	R to 122	C to 176	R to 140	---
Naphthalene C_{10}H_8	--	---	N	73	N	73	73	---	73	R to 194	---
Natural Gas	--	73	---	73	140	140	73	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Nickel Acetate $\text{Ni}(\text{OOCH}_3)_2 \cdot 4\text{H}_2\text{O}$	--	---	---	73	---	140	---	---	140	---	---
Nickel Chloride NiCl_2	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Nickel Nitrate $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	Sat'd	160	180	180	140	140	140	R to 248	140	---	---
Nickel Sulfate NiSO_4	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Nicotine $\text{C}_{10}\text{H}_{14}\text{N}_2$	--	---	180	---	140	140	140	---	140	---	---
Nicotinic Acid $\text{C}_6\text{H}_5\text{NCOOH}$	--	---	180	---	140	140	140	R to 212	140	---	---
Nitric Acid HNO_3	5%	---	---	---	---	---	---	R to 176	C to 140	N	---
	10%	C to 73	180	180	140	73	C to 73	R to 212	C to 140	---	---
	20%	---	---	---	---	---	---	R to 212	C to 140	---	---
	25%	---	---	---	---	---	---	R to 212	C to 140	---	---
	30%	N	R to 130	140	140	73	N	R to 212	C to 140	---	---
	35%	---	---	---	---	---	---	---	C to 140	---	---
	40%	N	R to 120	73	140	73	N	C to 248	140	---	---
	50%	N	110	N	100	C to 73	N	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	65%	---	---	---	---	---	---	C to 248	---	---	---
	70%	N	100	N	73	C to 73	N	---	C to 73	---	---
	85%	---	---	---	---	---	---	N	---	---	---
	95%	---	---	---	---	---	N	---	---	---	---
	100%	N	N	N	N	N	N	---	N	---	---
Nitrobenzene $C_6H_5NO_2$	100%	N	N	C to 140	N	N	---	R to 122	N	---	---
Nitroglycerine $CH_2NO_3 \cdot CHNO_3 \cdot CH_2NO_3$	--	---	---	---	N	73	---	---	73	---	---
Nitroglycol	--	---	---	---	N	---	---	---	---	---	---
Nitrous Acid HNO_2	10%	---	180	C to 73	140	73	---	---	73	---	---
Nitrous Oxide N_2O	--	---	73	73	73	73	---	---	73	---	---
n-Octane CH_8H_{18}	--	---	C to 73	---	---	---	---	---	---	---	---
Oleic Acid $CH_3(CH_2)_7CH_2CH(CH_2)_7COOH$	--	160	180	73	140	C to 140	150	R to 248	C to 140	R to 140	---
Oleum $xH_2SO_4 \cdot ySO_3$	--	N	N	N	N	N	N	N	N	---	---
Olive Oil	--	160	C to 180	73	140	140	---	R to 248	R to 68	---	---

Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
50%	160	180	140	140	140	140	---	140	---	---
o2H2O 10%	---	---	---	---	---	---	R to 140	---	R to 140	---
Sat'd	---	---	---	---	---	---	R to 122	---	---	---
--	160	180	N	140	140	---	R to 212	140	R to 140	---
--	---	180	C to 73	140	C to 120	---	---	C to 120	C to 68	---
Sat'd	---	---	---	---	---	---	R to 68	---	---	---
--	---	---	73	---	140	---	---	140	---	---
10%	73	73	180	140	120	150	---	120	---	---
COOH										
70%	---	73	180	73	120	---	---	120	---	---
--	73	180	140	140	C to 140	---	R to 212	C to 140	---	---
--	---	C to 180	140	---	---	---	R to 248	---	---	---
--	N	C to 180	N	C to 140	C to 120	---	---	C to 120	---	---
CH3										
d 40%	N	---	73	73	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Perchloric Acid (Type I) HClO ₄	10%	---	---	---	---	---	---	R to 212	---	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
Perchloric Acid (Type I) HClO ₄	15%	---	180	140	73	140	C to 73	---	140	---	---
Perchloric Acid (Type I) HClO ₄	70%	73	180	C to 73	73	73	N	R to 212	73	---	---
Perchloroethylene Cl ₂ C:CCl ₂	--	N	C to 180	C to 73	C to 140	C to 120	---	C to 212	C to 120	C to 68	---
Perphosphate	--	---	73	140	73	---	---	---	---	---	---
Petroleum Ether		---	---	---	---	---	---	R to 212	---	---	---
Phenol C ₆ H ₅ OH	--	N	73	73	73	140	73	---	140	N	---
	5%	---	---	---	---	---	---	---	R to 248	---	---
	50%	---	---	---	---	---	---	R to 176	---	---	---
	Solid	---	---	---	---	---	---	C to 122	---	---	---
	90%	---	---	---	---	R to 140	---	---	R to 140	---	---
Phenylhydrazine C ₆ H ₅ NHHN ₂	--	---	N	N	N	C to	---	R to 120	C to 104	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Phenylhydrazine Hydrochloride	10%	---	---	---	---	---	---	R to 140	---	---	---
Phosphine	Gas	---	---	---	---	---	---	R to 104	---	---	---
Phosphoric Acid $H_3 PO_4$	10%	---	180	212	140	140	140	---	140	---	---
	50%	73	180	212	140	140	73	R to 212	140	C to 104	---
	75%	---	---	---	---	---	---	R to 212	---	---	---
	85%	---	180	212	140	73	---	C to 284	73	---	---
	98%	---	---	---	---	---	---	R to 212	---	---	---
Phosphoric Anhydride-- $P_2 O_5$		---	73	73	73	---	---	---	---	---	---
Phosphorous (Red) --		---	---	---	73	140	---	---	140	---	---
Phosphorous (Yellow) --		--	---	---	73	140	---	---	140	---	---
Phosphorous Oxychloride	Liquid	---	---	---	---	---	---	R to 68	---	---	---
Phosphorous Pentoxide $P_2 O_5$	--	---	73	73	73	140	---	---	140	---	---
Phosphorous Trichloride PCl_3	--	--	N	73	N	120	C to 73	C to 122	120	---	---
Photographic Solutions	--	---	180	140	140	140	140	---	140	---	---
Phtalic Acid	--	---	---	140	C to	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
C ₆ H ₄ (COOH) ₂	Susp.	---	---	---	140 ---	---	---	R to 212	---	---	---
Picric Acid	10%	N	N	73	N	73	73	R to 212	73	C to 68	---
C ₆ H ₂ (NO ₂) ₃ OH	50%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd.	---	---	---	---	---	---	R to 212	---	---	---
Pine Oil	--	---	N	140	---	R to 73	---	---	R to 73	---	---
Plating Solutions (Brass)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Cadmium)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Chrome)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Copper)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Gold)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Lead)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Nickel)	--	---	180	140	140	140	C to 73	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Plating Solutions (Rhodium)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Silver)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Tin)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Zinc)	--	---	180	140	140	140	C to 73	---	140	---	---
Potash (Aq) KOH	Sat'd	---	180	---	140	140	---	---	140	---	---
Potassium Alum ALK (SO ₄) ₂ o12H ₂ O	--	---	180	---	140	140	---	---	140	---	---
Potassium Aluminum Sulphate	--	---	180	180	140	---	C to 73	---	---	---	---
Potassium Amyl Xanthate	--	---	---	---	73	---	---	---	---	---	---
Potassium Bicar- bonate KHCO ₃	Sat'd	---	180	140	140	140	140	R to 212	140	---	---
Potassium Bi- chromate K ₂ Cr ₂ O ₇	Sat'd 40%	---	180	140	140	---	C to 73	R to 212	---	---	---
		---	---	---	---	---	---	R to 212	---	---	---
Potassium Bisulfate KHSO ₄	--	---	180	212	140	140	---	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Potassium Borate $K_2 B_4 O_7 \cdot 5H_2 O$	--	--	180	140	140	140	140	R to 212	140	---	---
Potassium Bromate $KBrO_3$	--	---	180	212	140	140	140	R to 212	140	---	---
	10%	---	---	---	---	---	---	---	R to 212	---	---
Potassium Bromide KBr	--	---	180	212	140	140	140	R to 248	140	---	---
Potassium Carbonate $K_2 CO_3$	--	73	180	180	140	140	140	N	140	---	---
Potassium Chlorate $KClO_3$ (Aqueous)	--	160	180	212	140	140	140	N	140	---	---
Potassium Chloride KCl	--	160	180	212	140	140	140	R to 212	140	---	---
Potassium Chromate $K_2 CrO_4$	--	---	180	212	140	140	140	---	140	---	---
Potassium Cyanide KCN	--	---	180	180	140	140	140	R to 212	140	---	---
Potassium Dichromate $K_2 Cr_2 O_7$	Sat'd	--	180	180	140	140	140	---	140	---	---
Potassium Ethyl Xanthate $KS_2 COC_2 H_5$	--	---	---	---	73	---	---	---	---	---	---
Potassium	--	---	180	180	140	140	140	R to	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Ferricyanide $K_3 Fe(CN)_6$								248			
Potassium Ferrocyanide $K_4 Fe(CN)_6 \cdot 3H_2O$	--	---	180	180	140	140	---	R to 248	140	---	---
Potassium Fluoride KF	--	---	180	180	140	140	140	R to 212	140	---	---
Potassium Hydroxide 4% KOH		---	---	---	---	---	---	C to 104	---	---	---
	10%	---	---	---	---	---	---	R to 176	---	---	---
	20%	---	---	---	---	---	---	R to 176	---	---	---
	25%	160	180	212	140	R to 140	140	---	R to 140	---	---
	45%	---	---	---	---	---	---	---	---	---	R to 73
	50%	---	---	---	---	---	---	R to 176	---	C to 104	---
Potassium hydrogen Sulphite	10%	---	---	---	---	---	---	R to 140	---	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Hyprochlorite KClO	-- 3%	160	180	---	140	120	---	---	120	---	---
			---	---	---	---	---	---	R to 212	---	---
Potassium Iodide KI	--	---	180	73	73	140	---	R to 212	140	---	---
Potassium Nitrate	--	160	180	140	140	140	140	---	140	C to	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
KNO ₃	50%	---	---	---	---	---	---	R to 212	---	104	---
Potassium Orthophosphate	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Perborate --		---	180	140	140	140	140	---	140	---	---
Potassium Perchlorate -- KClO ₄		---	180	140	140	140	140	---	140	---	---
Potassium Permanganate KmnO ₄	10%	---	180	73	140	140	140	R to 176	140	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	25%	---	180	73	73	140	---	---	140	---	---
	30%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Persulfate -- K ₂ S ₂ O ₈		---	180	140	140	140	140	R to 176	140	---	---
Potassium Sulfate -- K ₂ SO ₄		160	180	180	140	140	140	R to 212	140	194	---
Potassium Sulfide -- K ₂ S		---	180	140	---	140	140	68	140	---	---
Potassium Sulfite -- K ₂ SO ₃ o2H ₂ O		---	180	140	---	140	---	---	140	---	---
Propane C ₃ H ₈	--	---	73	73	140	140	73	R to 248	140	140	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Propargyl Alcohol $\text{HC}\equiv\text{CCH}_2\text{OH}$	--	---	C to 180	140	140	140	140	---	140	---	---
Propionic Acid $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$	--	N	N	140	---	140	---	R to 140	140	---	---
Propyl Alcohol (Type I) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	--	73	C to 73	140	140	R to 140	140	R to 122	R to 140	---	---
Propylene Carbonate 100%		---	---	---	---	---	---	---	---	---	R to 73
Propylene Dichloride 100 $\text{CH}_3\text{CHClCH}_2\text{Cl}$		---	N	N	N	N	---	---	N	---	---
Propylene Oxide $\text{CH}_3\text{CHCH}_2\text{O}$	--	---	N	73	N	140	---	---	140	---	---
Pyridine $\text{N}(\text{CH})_4\text{CH}$	--	---	N	C to 140	N	73	---	R to 68	73	C to 68	---
Pyrogalllic Acid $\text{C}_6\text{H}_3(\text{OH})_3$	--	---	---	---	73	--	--	---	---	---	---
Quinone $\text{C}_6\text{H}_4\text{O}_2$	--	---	---	140	---	140	---	---	140	---	---
Rayon Coagulating Bath	--	---	180	---	140	140	140	---	140	---	---
Salicylaldehyde $\text{C}_6\text{H}_4\text{OHCHO}$	--	---	---	73	N	120	---	---	120	---	---
Salicylic Acid $\text{C}_6\text{H}_4(\text{OH})(\text{COOH})$	--	---	---	---	140	140	140	---	R to 212	140	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Selenic Acid Aq. $H_2 SeO_4$	--	---	180	---	140	140	140	---	140	---	---
Silicic Acid SiO_2 on $H_2 O$	--	---	180	140	140	140	140	R to 212	140	---	---
Silicone Oil	--	---	180	212	73	73	---	---	73	---	---
Silver Acetate	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Silver Chloride $AgCl$	--	160	180	140	140	---	---	---	---	---	---
Silver Cyanide $AgCN$	--	---	180	180	140	140	140	R to 212	140	---	---
Silver Nitrate $AgNO_3$	--	160	180	180	140	R to 140	C to 73	---	R to 140	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Silver Sulfate $Ag_2 SO_4$	--		160	180	140	140	140 73	C to	---	140	---
Soaps	--	73	180	140	140	R to 140	140	---	R to 140	---	---
Sodium Acetate $NaC_2 H_3 O_2$	Sat'd	---	180	212	140	140	140	R to 212	140	---	---
Sodium Alum $AlNa(SO_4)_2 \cdot 12H_2 O$	--	---	180	---	140	---	---	---	---	---	---
Sodium Aluminate $Na_2 Al_2 O_3$	Sat'd	---	---	---	140	---	---	---	---	---	---

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Benzoate	--	---	180	140	140	140	140	---	140	---	---
C ₆ H ₅ COONa	35%	---	---	---	---	---	---	R to 68	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bicarbonate NaHCO ₃	--	73	180	212	140	140	140	R to 212	140	---	---
Sodium Bichromate	Sat'd	---	180	---	140	---	---	---	---	---	---
Na ₂ Cr ₂ O ₇ ·2H ₂ O	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bisulfate	--	73	180	140	140	140	140	---	140	---	---
NaHSO ₄	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bisulfite NaHSO ₃	--	---	180	140	140	140	---	---	140	---	---
Sodium Borate (Borax) Na ₂ B ₄ O ₇ ·10H ₂ O	Sat'd	160	180	180	140	140	140	---	140	---	---
Sodium Bromide	Sat'd	120	180	140	140	140	140	---	140	---	---
NaBr	50%	---	---	---	---	---	---	R to 248	---	---	---
Sodium Carbonate Na ₂ CO ₃	--	73	180	212	140	140	140	N	140	R to 140	---
Sodium Chlorate NaClO ₃	Sat'd	---	180	140	73	140	140	N	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Chloride	---	120	180	212	140	140	140	---	140	---	---
NaCl	Sat'd	---	---	---	---	---	---	R to 212	---	194	---
	10%	---	---	---	---	---	---	R to 212	---	---	R to 176
Sodium Chlorite	25%	---	180	73	N	140	---	---	140	---	---
NaClO ₂											
Sodium Chromate	--	120	180	140	---	140	---	R to 176	140	---	---
Na ₂ CrO ₄ o10H ₂ O											
Sodium Cyanide	--	---	180	180	140	140	140	R to 212	140	---	---
NaCN											
Sodium Dichromate	20%	---	180	180	140	140	140	---	140	---	---
Na ₂ Cr ₂ O ₇ o2H ₂ O											
Sodium Ferricyanide	Sat'd	---	180	140	140	140	140	---	140	---	---
Na ₃ Fe(CN) ₆ o2H ₂ O											
Sodium Ferrocyanide	Sat'd	---	180	140	140	140	140	---	140	---	---
Na ₃ Fe(CN) ₆ o10H ₂ O											
Sodium Fluoride	--	120	180	180	140	140	140	R to 212	140	---	---
NaF											
Sodium Hydrogen Sulphite	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Hydroxide	1%	---	---	---	---	---	---	---	R to 140	---	---
NaOH											
	5%	---	---	---	---	---	---	C to 68	---	---	---
	15%	120	180	212	140	140	140	---	R to 140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	30%	120	180	212	140	R to 140	140	N	R to 140	---	---
	40%	---	---	---	---	---	---	---	R to 140	---	---
	50%	120	180	212	140	140	140	---	140	C to 104	---
	60%	---	---	---	---	---	---	---	R to 140	---	---
	70%	120	180	212	140	140	140	---	140	---	---
Sodium Hypochlorite	--	120	180	73	73	140	140	---	140	---	N
NaOClO ₅ H ₂ O	2% Cl	---	---	---	---	---	---	R to 212	---	---	---
	12.5% Cl	---	---	---	---	---	---	R to 68	---	---	---
Sodium Iodide NaI	--	---	180	---	140	---	---	---	---	---	---
Sodium Metaphosphate (NaPO ₃) _n	--	---	180	120	140	---	---	---	---	---	---
Sodium Nitrate NaNO ₃	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Sodium Nitrite NaNO ₂	--	160	180	73	140	140	140	R to 212	140	---	---
Sodium Palmitate CH ₃ (CH ₂) ₁₄ COONa	5%	---	180	140	140	---	---	---	---	---	---
Sodium Perborate NaBO ₂ o3H ₂ O	--	120	180	73	140	73	---	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Perchlorate NaClO_4	--	---	180	212	140	140	---	---	140	---	---
Sodium Peroxide $\text{Na}_2 \text{O}_2$	10%	---	180	---	140	140	---	---	140	---	---
Sodium Phosphate $\text{NaH}_2 \text{PO}_4$	Acid	120	180	212	140	140	140	R to 140	140	---	---
	Alkaline		120	180	212	140	140	---	140	---	---
	Neutral		120	180	212	140	140	---	R to 212	---	---
Sodium Silicate $2\text{Na}_2 \text{O} \cdot \text{SiO}_2$	--	---	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 140	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Sulfate Na_2SO_4	Sat'd	160	180	212	140	140	140	R to 212	---	---	---
	0.1%	---	---	---	---	---	---	R to 140	---	---	---
Sodium Sulfide Na_2S	Sat'd	160	180	212	140	140	140	---	140	C to 104	---
Sodium Sulfite Na_2SO_3	Sat'd	160	180	212	140	140	140	R to 212	140	---	---
Sodium Thiosulphate $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$	--	---	180	180	140	140	140	---	140	---	---
	50%	---	---	---	---	---	---	R to 248	---	---	---
Sour Crude Oil	--	---	---	140	140	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Soybean Oil	--	---	---	73	---	140	---	---	140	---	---
Stannic Chloride SnCl ₄	Sat'd	---	180	140	140	140	140	---	140	---	---
Stannous Chloride SnCl ₂	15% Sat'd	120 ---	180 ---	140 ---	140 ---	140 140	140 ---	---	140 140	---	---
Starch	--	---	180	140	140	140	---	---	140	---	---
Starch Solution	Sat'd	---	---	---	---	140	---	---	140	---	---
Stearic Acid CH ₃ (CH ₂) ₁₆ COOH	-- 100%	---	180 ---	73 ---	140 ---	120 R to 120	150 ---	---	120 R to 120	C to 194 ---	---
Stoddard's Solvent	--	---	N	---	N	73	140	---	73	---	---
Styrene (C ₆ H ₅ CHCH ₂) _n	--	---	---	73	---	C to 73	---	---	C to 73	R to 104	---
Succinic Acid CO ₂ H(CH ₂) ₂ CO ₂ H	--	---	180	140	140	140	---	---	140	---	---
Sugar C ₆ H ₁₂ O ₆	Aq.	---	180	---	140	140	---	---	140	---	---
Sulfamic Acid HSO ₃ NH ₂	20%	--	N	180	N	---	---	---	---	---	---
Sulfate Liquors (Oil)	6%	---	180	140	140	---	---	---	---	---	---
Sulfite Liquors	6%	73	180	---	140	140	---	---	---	---	---
Sulfur	--	---	180	212	140	140	140	---	---	104	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
S											
Sulfur Chloride S ₂ Cl	--	---	---	C to 73	---	---	---	---	---	---	---
Sulfur Dioxide SO ₂	Gas Dry	N	73	140	140	140	---	---	140	---	---
Sulfur Dioxide	Gas Wet	N	N	140	73	120	73	N	120	---	---
Sulfur Trioxide SO ₃	Gas Dry	---	---	---	140	N	---	N	N	C to 68	---
Sulfur Trioxide SO ₃	Gas	---	N	---	73	N	---	N	---	---	---
Sulfuric Acid H ₂ SO ₄	5%	---	---	---	---	---	---	---	---	---	R to 73
	30%	120	180	180	140	140	140	R to 248	R to 140	---	N
	50%	73	180	140	140	120	C to 73	R to 212	R to 140	---	---
	60%	C to 73	180	73	140	120	C to 73	R to 248	---	---	---
	70%	C to 73	180	73	140	R to 120	C to 73	---	---	---	---
	80%	C to 73	180	73	140	R to 120	N	C to 248	---	---	---
	90%	C to 73	150	73	73	120	N	R to 212	---	---	---
	93%	N	140	C to 73	73	C to 73	N	---	---	---	---
	94% - 98%	N	130	C to 73	N	C to 73	N	C to 212	N	---	---
	100%	N	N	C to	N	C to	N	---	---	C to	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
				73		73				194	
Sulfurous Acid H_2SO_3	--	---	180	140	140	140	140	R to 212	140	---	---
Tall Oil	--	---	C to 180	180	140	120	---	---	120	---	---
Tannic Acid $C_{76}H_{52}O_{46}$	10%	N	180	73	140	140	140	R to 212	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Tanning Liquors	--	160	180	73	140	120	140	---	120	---	---
Tar	--	---	N	---	N	---	---	---	---	---	---
Tartaric Acid $HOOC(CHOH)_2COOH$	--	160	180	140	140	140	140	R to	140	---	---
	Sat'd	---	---	---	---	---	---	R to 248	R to 176	R to 194	---
Terpineol $C_{10}H_{17}OH$	--	---	---	---	C to 140	---	---	---	---	---	---
Tetrachloroethane $CHCl_2CHCl_2$	--	---	---	C to 73	C to 140	C to 120	---	---	C to 120	---	---
Tetrachloroethylene $Cl_2C:CCl_2$	--	N	N	C to 73	---	---	---	---	---	---	---
Tetraethyl Lead $Pb(C_2H_5)_4$	--	---	73	73	73	---	---	---	---	68	---
Tetrahydrofuran C_4H_8O	--	N	N	C to 73	N	C to 73	C to 73	C to 68	N	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Tetralin $C_{10}H_{12}$	--	---	N	N	N	N	---	---	N	---	---
Tetra Sodium Pyrophosphate $N_9P_2O_7 \cdot 10H_2O$	--	---	180	---	140	---	---	---	---	---	---
Thionyl Chloride $SOCl_2$	--	---	N	N	N	N	140	N	N	---	---
Thread Cutting Oils	--	---	73	73	73	---	---	---	---	---	---
Tin (II) Chloride		---	---	---	---	---	---	R to 212	---	---	---
Tin (IV) Chloride		---	---	---	---	---	---	R to 212	---	---	---
Titanium Tetrachloride $TiCl_4$	--	---	---	140	C to 73	120	---	---	120	---	---
Toluene (Toluol) $CH_3C_6H_5$	--	N	N	C to 73	N	C to 120	N	---	C to 120	R to 140	R to 73
Tomato Juice	--	---	180	212	140	140	---	---	140	--	---
Transformer Oil	--	---	180	73	140	C to 120	---	---	C to 120	---	---
Transformer Oil DTE/30	--	---	180	---	140	R to 120	---	---	R to 120	---	---
Tributyl Citrate	--	---	---	C to 73	73	C to 120	---	---	C to 120	---	---
Tributyl Phosphate $(C_4H_9)PO_4$	--	---	N	C to 140	N	73	---	---	73	R to 194	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Trichloroacetic Acid CCl_3COOH	50%	---	---	140	140	140	---	R to 104	140	---	---
	10%	---	---	---	---	140	---	---	140	---	---
Trichlorobenzene		---	---	---	---	---	---	R to 140	---	---	---
Trichloroethane		---	---	---	---	---	---	---	---	---	R to 122
Trichloroethylene $\text{CHCl}:\text{CCl}_2$	--	N	N	N	N	C to 120	N	R to 176	C to 68	C to 68	R to 176
Triethanolamine $(\text{HOCH}_2\text{CH}_2)_3\text{N}$	--	C to 73	73	140	73	73	73	C to 104	73	---	---
Triethylamine $(\text{C}_2\text{H}_5)_3\text{N}$	--	---	---	N	140	73	---	---	73	---	---
Trimethylpropane $(\text{CH}_2\text{OH})_3\text{C}_3\text{H}_5$	--	---	---	140	73	C to 120	---	---	C to 120	---	---
Trisodium Phosphate $\text{NaPO}_4 \cdot 12\text{H}_2\text{O}$	--	73	180	140	140	140	140	---	140	---	---
Turpentine	--	N	N	N	140	C to 120	C to 73	---	C to 120	R to 140	---
Urea $\text{CO}(\text{NH}_2)_2$	--	---	180	180	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd	---	---	---	---	---	---	R to 176	---	C to 140	---
Urine	--	160	180	180	140	140	140	---	140	---	---
Vaseline (Petroleum Jelly)	--	---	N	140	N	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Vegetable Oil	--	---	C to 180	140	140	R to 140	---	R to 248	R to 140	---	---
Vinegar	--	73	150	140	140	140	140	---	140	194	---
Vinyl Acetate <chem>CH3COOCH:CH2</chem>	--	---	N	73	N	140	---	C to 68	140	---	---
Water, Acid Mine H ₂ O	--	160	180	140	140	140	180	---	140	---	194
Water, Deionized H ₂ O	--	160	180	140	140	140	180	---	140	194	176
Water, Distilled H ₂ O	--	160	180	212	140	140	180	R to 248	140	194	---
Water, Potable H ₂ O	--	160	180	212	140	140	180	R to 248	140	194	---
Water, Salt H ₂ O	--	160	180	212	140	140	180	---	140	194	---
Water, Sea H ₂ O	--	160	180	212	140	140	180	R to 248	140	194	R to 176
Water, Soft H ₂ O	--	160	180	212	140	140	180	---	140	194	---
Water, Waste H ₂ O	--	73	180	212	140	140	180	---	140	194	---
Whiskey	--	---	180	140	140	140	140	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
White Liquor	--	73	180	---	140	---	---	---	---	---	---
Wine	--	73	180	140	140	140	140	R to 248	140	---	---
Wines and Spirits		---	---	---	---	---	---	R to 212	---	---	---
Xylene (Xylol) $C_6H_4(CH_3)_2$	--	N	N	N	N	N	N	C to 140	N	C to 194	---
Zinc Acetate $Zn(C_2H_3O_2)_2 \cdot 2H_2O$	--	---	180	---	---	---	---	---	---	---	---
Zinc Carbonate $ZnCO_3$	--	---	180	140	---	140	---	R to 212	140	---	---
Zinc Chloride $ZnCl_2$	--	120	180	180	140	140	---	---	140	---	---
	50%	--	--	--	--	--	--	--	--	C to 73	--
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Zinc Nitrate $Zn(NO_3)_2 \cdot 6H_2O$	--	160	180	180	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Zinc Oxide		---	---	---	---	---	---	R to 212	---	---	---
Zinc Stearate		---	---	---	---	---	---	R to 122	---	---	---
Zinc Sulfate $ZnSO_4 \cdot 7H_2O$	--	160	180	212	140	140	140	---	140	---	---
	Sat'd		---	---	---	---	---	---	R to	---	---

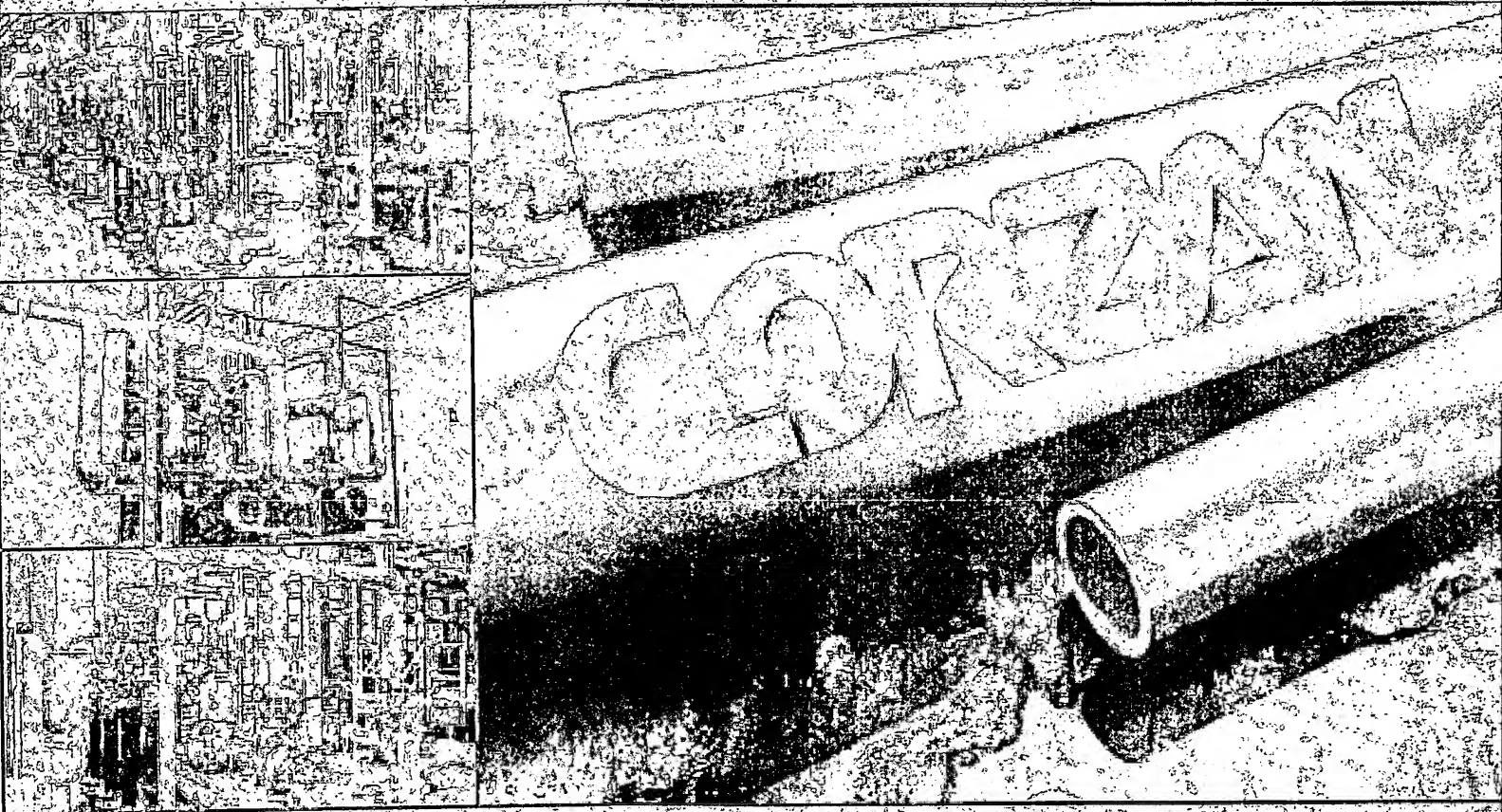
Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK ..
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CORZAN™

INDUSTRIAL SYSTEMS

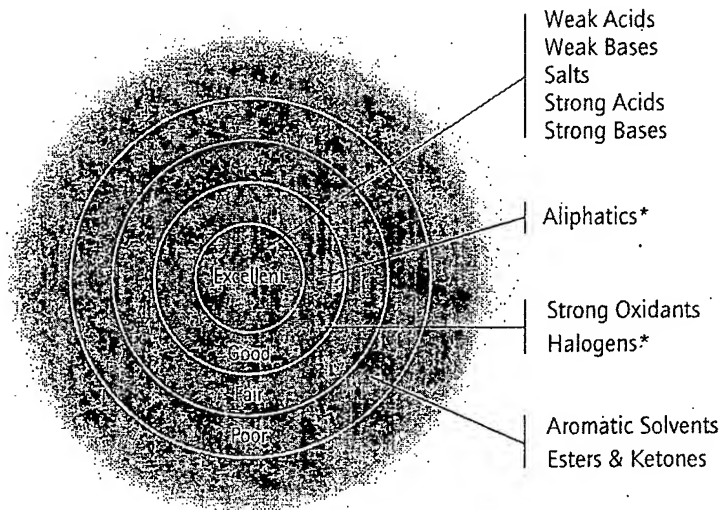
Chemical Resistance Data



noveon

The Specialty Chemicals Innovator™

CorzanTM Industrial Systems



Corzan[®] CPVC
Chemical Resistance

*Consult Noveon for specific data.

One of the key advantages of Corzan[®] CPVC is its excellent resistance to a broad range of corrosive environments. By replacing traditional materials with Corzan[®] CPVC, engineers can extend equipment service life and reduce maintenance, while minimizing process life-cycle costs. This technical report is intended to provide engineers and end-users with guidance as to the suitability of Corzan[®] industrial piping systems in corrosive applications. In general, Corzan[®] CPVC is inert to most mineral acids, bases, salts, and aliphatic hydrocarbons, and compares favorably to other non-metals in these chemical environments. Specific use conditions must also be considered since these will determine the chemical resistance of any thermoplastic piping system. Variables that can affect chemical resistance include chemical concentration, temperature, pressure, external stress, and final product quality. Since the number of possible use conditions is so large, the final decision regarding material suitability often must be based on in-service testing. The information contained in this report was developed to include conditions that are most often encountered in industry. CPVC samples were immersed in the particular reagent for at least 90 days at 73°F (23°C) and 180°F (82°C). Changes in weight and tensile strength for each sample were reviewed in conjunction with field experience and information gathered from various sources to develop recommendations shown. Note that these recommendations are based on specific use conditions and may not apply to all situations. For this reason, the final decision regarding material suitability must rest with the end-user. The notes following the chemical resistance chart list specific areas where caution must be used when considering Corzan[®] CPVC. Additional chemical resistance data will become available as testing of Corzan[®] CPVC continues. Consult with your product supplier or Noveon for the latest Corzan[®] CPVC chemical resistance information.

CORZANTM
INDUSTRIAL SYSTEMS

N.B. Information presented within this report is based on test data and field experience of CPVC manufactured by Noveon and is not intended to reflect the properties found with other suppliers of CPVC materials. To determine if your supplier is using Corzan CPVC, call the Corzan Marketing Department at 888-234-2436.

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Chemical Compatibility Case Study

An excellent example of an industrial system's performance in a demanding process application is an installation at Kodak's state-of-the-art lithographic plate manufacturing facility in Colorado. At this facility Kodak manufactures more than 8,000 varieties of lithographic offset printing plates in dimensions up to ten feet long.

To manufacture the plates, large coils of aluminum are unrolled, and one side of the aluminum sheet is chemically treated to provide a grained surface, which is then coated with a light-sensitive photopolymer. After this coating step, the aluminum is cut to the appropriate dimensions and packaged.

The Kodak Story

Prior to the construction of the plate manufacturing facility in 1990, Jim Loomis, Senior Plate Manufacturing Engineer, was faced with many important design decisions. Not only would the piping material have to meet Kodak's high quality standards, but it would have to safely handle the aggressive chemicals used in the plate etching process at temperatures up to 180°F (82°C).

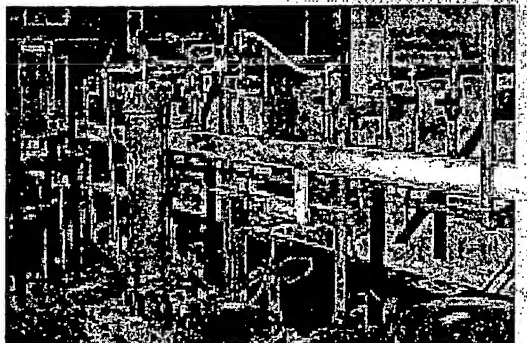
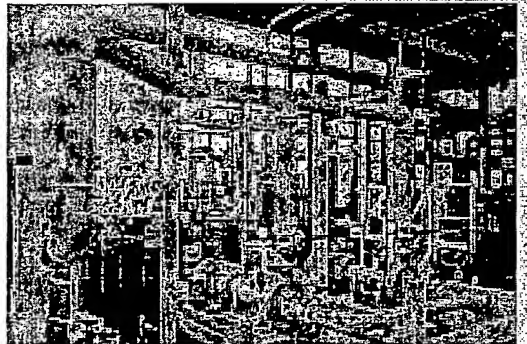
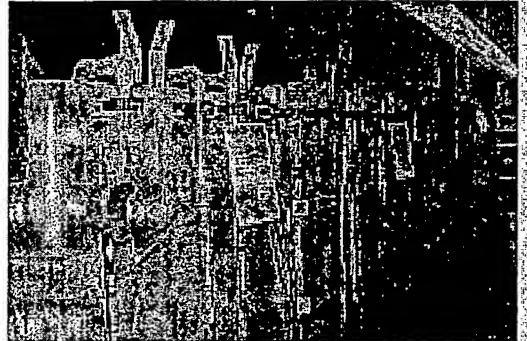
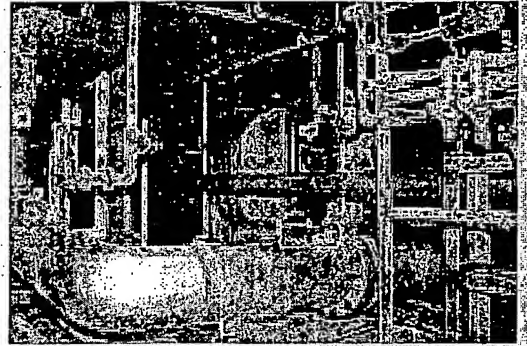
Some of the chemicals used in the process are:

- Caustic Etching Solution
- 30% Nitric Acid
- 50% Sodium Hydroxide

In addition, Jim wanted to specify the system in a single material for design efficiency and quality assurance. The system also had to be available in iron pipe sizes from 1" (25mm) up to 12" (300mm), including a wide variety of piping, fittings and valves.

After a comprehensive materials study, one material, CPVC, was specified for the entire system. Resistance to a variety of harsh chemicals at high temperatures, as well as mechanical strength up to 180°F (82°C) were all key elements in specification decision. Jim was also extremely pleased with the economically-priced process piping and components available from a team of quality manufacturers.

If your next project includes corrosive chemicals, high temperatures, or a wide range of service conditions, think of Corzan Industrial Systems first.



Noted Caution Areas for CPVC

CPVC is not recommended for use with most polar-organic materials including various solvents i.e., chlorinated or aromatic hydrocarbons, esters, or ketones.

Resistance of CPVC to certain other fluid mixtures such as fuel oils with moderate aromatic content cannot be determined on basis of immersion testing alone. Actual use data must be obtained.

There are a number of similarities in chemical resistance between PVC and CPVC materials. However, one must exercise caution when comparing the chemical resistance properties of CPVC to those of PVC, which are not always the same.

CPVC test samples exposed while under stress to surfactants, certain oils, or grease have shown signs of environmental stress cracking. Environmental stress cracking is a situation in which the manufactured pipe or fittings are weakened by contact with certain chemicals and cracks are propagated by external stresses. External stresses include not only the known pressure stress on a system but also stresses from sources such as expansion and installation. When CPVC is intended for use in handling such chemicals, special consideration should be taken during design and installation to avoid unusual stresses in the piping system, or advance testing of the chemical in simulated use conditions is strongly suggested.

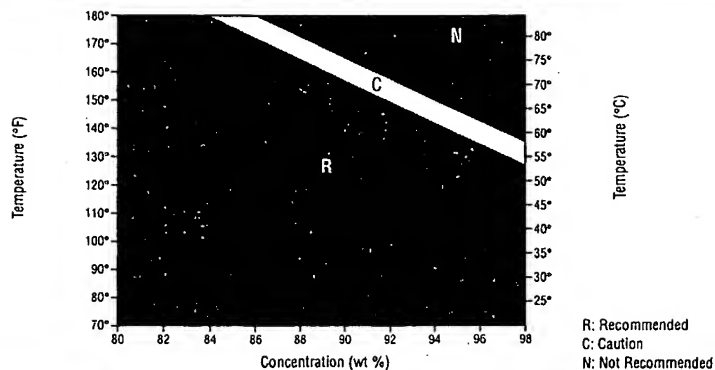
Certain organic solvents which are soluble with water, such as alcohols, may safely be handled below a certain concentration. Many of these limiting concentrations are noted in Table 1. Solvents which are insoluble in water, such as aromatics, will be absorbed by the piping over time, even when they are present at very low levels in the water. This will lead to a decreased service life expectancy for the system.

The full hydrostatic pressure rating of the pipe may not apply to the entire range of temperature and concentration designated as "recommended".

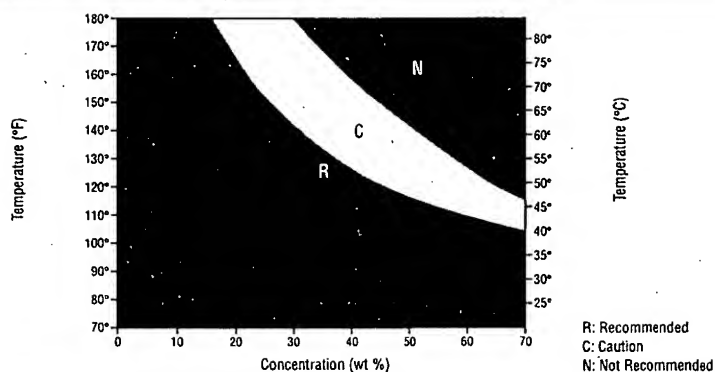
CPVC is not recommended for fuming acid service.

Contact your piping supplier or Noveon for consultation and/or the latest chemical resistance information.

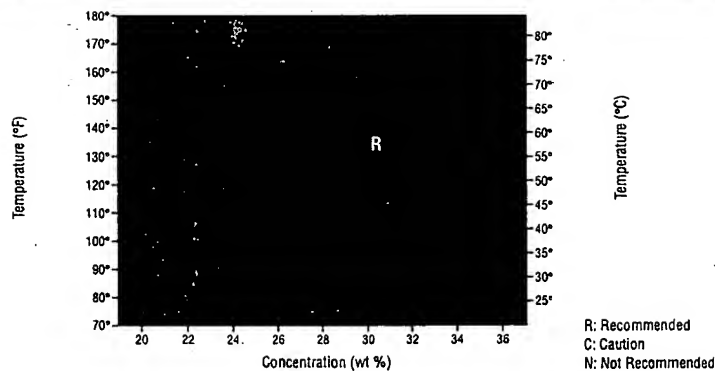
Chemical Resistance of Corzan® CPVC to Sulfuric Acid



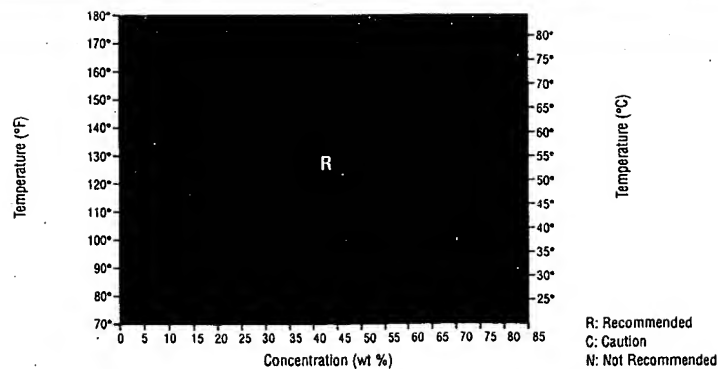
Chemical Resistance of Corzan® CPVC to Nitric Acid



Chemical Resistance of Corzan® CPVC to Hydrochloric Acid



Chemical Resistance of Corzan® CPVC to Phosphoric Acid



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CPVC COMPOUNDS

CHEMICAL RESISTANCE

Industrial Plumbing Applications

ProTherm®

CPVC COMPOUNDS

FEATURES AND BENEFITS

- High strength and ductility
- Heat resistant
- Functional use in high temperature environments
- Chemical resistant
- Unaffected by most corrosive environments
- Flame retardancy
- Inherently self-extinguishing
- Low smoke characteristics
- Outstanding electrical insulation characteristics
- Readily processable
- Good thermal stability and flow
- Resistant to gate blush and weld lines
- Finishing capabilities
- Available in standard and custom colors
- Code approved
- Listed by National Sanitation Foundation
- Underwriters Laboratories 94-V-O and 94-5V ratings

Georgia Gulf

Technical Center

P.O. BOX 629 • 56505 EVERGREEN ROAD
PLAQUEMINE, LOUISIANA 70765-0629
PHONE: (504) 685-1200

TABLE 2

ACTUAL CHEMICAL RESISTANCE TESTING, EXPERIENCE AND
REFERENCE INFORMATION

KEY: R - Resistant NR - Not Recommended

REAGENT	TEMPERATURE		REAGENT	TEMPERATURE		REAGENT	TEMPERATURE	
	73°	180°		73°	180°		73°	180°
A								
Acetaldehyde	NR	NR	Barium Chloride	R	R	Chlorox Bleach Solution	R	R
Acetic Acid, Pure	NR	NR	Barium Hydroxide	R	R	Chrome Alum	R	R
Acetic Acid, 10%	R	R	Barium Nitrate	R	R	Chromic Acid, 10%	R	R
Acetic Acid, 20%	NR	NR	Barium Sulfate	R	R	Chromic Acid, 50%	NR	NR
Acetic Acid, 80%	NR	NR	Barium Sulfide	R	R	Citric Acid	R	R
Acetic Acid, Glacial	NR	NR	Beech	R	R	Coconut Oil	NR	NR
Acetic Anhydride	NR	NR	Beet Sugar Liquors	R	R	Copper Carbonate	R	R
Acetone	NR	NR	Benzaldehyde, 10%	NR	NR	Copper Chloride	R	R
Acetyl Nitrate	NR	NR	Benzaldehyde, Above 10%	NR	NR	Copper Cyanide	R	R
Acrylic Acid Ethyl Ester	NR	NR	Benzene	NR	NR	Copper Fluoride	R	R
Adipic Acid	NR	NR	Benzoic Acid	R	NR	Copper Nitrate	R	R
Alcohol, Butyl	NR	NR	Bismuth Carbonate	R	R	Copper Sulfate	R	R
Alcohol, Ethyl	NR	NR	Black Liquor	R	R	Corn Syrup	R	R
Alcohol, Methyl, Butyl	NR	NR	Bleach (12% Cl)	R	R	Cottonseed Oil	NR	NR
Alcohol, Propyl, Ethyl	NR	NR	Borax	R	R	Cresol	NR	NR
Allyl Alcohol, 96%	NR	NR	Boric Acid	R	R	Cresylic Acid, 50%	R	R
Allyl Chloride	NR	NR	Bromic Acid	R	R	Crotonaldehyde	NR	NR
Alum	R	R	Bromine	NR	NR	Crude Oil	R	NR
Aluminum Alum	R	R	Bromobenzene	NR	NR	Cupric Fluoride	R	R
Aluminum Chloride	R	R	Bromine Water	NR	NR	Cupric Sulfate	R	R
Aluminum Fluoride	R	R	Butadiene	NR	NR	Cuprous Chloride	R	R
Aluminum Hydroxide	R	R	Butanol, Primary	NR	NR	Cyclohexanol	NR	NR
Aluminum Oxide	R	R	Butanol, Secondary	NR	NR	Cyclohexanone	NR	NR
Aluminum Nitrate	R	R	Butyl Acetate	NR	NR			
Aluminum, Sulfate	R	R	Butyl Alcohol	NR	NR			
Ammonia (Liquid)	NR	NR	Butyl Mercaptan	NR	NR			
Ammonium Acetate	R	R	Butyl Phenol	R	NR			
Ammonium Alum	R	R	Butyne Diol	NR	NR			
Ammonium Bisulfide	R	R	Butyric Acid	NR	NR			
Ammonium Bisulfate	R	R						
Ammonium Carbonate	R	R	C					
Ammonium Chloride	R	R	Cadmium Cyanide	R	R	Detergents	R	R
Ammonium Dichromate	R	R	Calcium Bisulfide	R	R	Dextrin	R	R
Ammonium Fluoride, 25%	NR	NR	Calcium Bisulfite	R	R	Dextrose	R	R
Ammonium Hydroxide	NR	NR	Calcium Carbonate	R	R	Diaz Salts	R	R
Ammonium Metaphosphate	R	R	Calcium Chlorate	R	R	Dimethyl Hydrazine	NR	NR
Ammonium Nitrate	R	R	Calcium Chloride	R	R	Dimethylamine	NR	NR
Ammonium Persulfate	R	R	Calcium Hydroxide	R	R	Diethylphthalate	NR	NR
Ammonium Phosphate	R	R	Calcium Hypochlorite	R	R	Disodium Phosphate	R	R
Ammonium Sulfate	R	R	Calcium Nitrate	R	R	Distilled Water	R	R
Ammonium Sulfide	R	R	Calcium Oxide	R	R			
Ammonium Thiocyanate	R	R	Calcium Sulfate	R	R			
Amyl Acetate	NR	NR	Carbon Bisulfide	NR	NR	E		
Amyl Alcohol	NR	NR	Carbon Dioxide	R	R	Esters	NR	NR
Amyl Chloride	NR	NR	Carbon Monoxide	R	R	Ethers	NR	NR
Aniline	NR	NR	Carbon Tetrachloride	NR	NR	Ethyl Acetate	NR	NR
Aniline Chlorohydrate	NR	NR	Carbonic Acid	R	R	Ethyl Acrylate	NR	NR
Aniline Hydrochlorate	NR	NR	Caustic Potash	R	R	Ethyl Alcohol	NR	NR
Anthraquinone	R	NR	Cellosolve	NR	NR	Ethyl Chloride	NR	NR
Anthraquinonesulfonic Acid	R	R	Caustic Soda	R	R	Ethyl Ether	NR	NR
Antimony Trichloride	R	R	Chloracetic Acid	R	NR	Ethylene Bromide	NR	NR
Aqua Regia	NR	NR	Chloral Hydrate	R	R	Ethylene Chlorohydrin	NR	NR
Aromatic Hydrocarbons	NR	NR	Chloric Acid, 20%	R	R	Ethylene Dichloride	NR	NR
Arsenic Acid, 80%	R	R	Chloride (Water)	R	R	Ethylene Glycol (100%)	NR	NR
Arsenic Trioxide (Powder)	R	R	Chlorine Gas (Dry)	NR	NR	Ethylene Glycol (50%)	R	R
Arylsulfonic Acid	R	NR	Chlorine Gas (Wet)	NR	NR	Ethylene Oxide	NR	NR
			Chlorine (Water)	R	R			
B			Chlorobenzene	NR	NR	F		
Barium Carbonate	R	R	Chloroform	NR	NR	Fatty Acids	R	R
			Chloropicein	NR	NR	Ferric Acetate	R	NR
			Chlorosulfonic Acid	R	NR	Ferric Chloride	R	R
						Ferric Hydroxide	R	R
						Ferric Nitrate	R	R
						Ferric Sulfate	R	R
						Ferrous Chloride	R	R
						Ferrous Nitrate	R	R

REAGENT		TEMPERATURE 73° 180°	
Ferrous Sulfate	R R		
Fish Solubles	R R		
Fluorine Gas	NR NR		
Fluosilic Acid, (25%)	R NR		
Formaldehyde	NR NR		
Formic Acid	R NR		
Fructose	R R		
Fruit Juices And Pulp	R R		
Furfural	NR NR		
Freons	NR NR		
Garene 500	NR NR		
G			
Gallic Acid	R R		
Gasoline	NR NR		
Glucose	R R		
Gas (Coke Oven)	NR NR		
Glycerine	R R		
Glycolic Acid	R R		
Grapesugar	R R		
Gulpride No. 10 Oil	R R		
H			
Heptane	R NR		
Hexane	R NR		
Hexanol, Tertiary	NR NR		
Hydrobromic Acid, 20%	R R		
Hydrochloric Acid, 10%	R R		
Hydrochloric Acid Conc. (36%)	R NR		
Hydrofluoric Acid, 48%	NR NR		
Hydroflusilic Acid	R NR		
Hydrogen Peroxide, 30%	R R		
Hydrogen Phosphide	R R		
Hydrogen Sulfide, Aqueous	R R		
Hydroquinone	R R		
Hydroxylamine Sulfate	R R		
Hypochlorous Acid	R R		
Hydrazine (Anhydrous), 97%	NR NR		
I			
Iodine	NR NR		
Isopropanol	NR NR		
K			
Kerosene	NR NR		
Ketones	NR NR		
Kraft Liquors	NR NR		
L			
Lactic Acid, 80%	R NR		
Lactic Acid, 25%	R R		
Lauric Acid	R R		
Lauryl Chloride	NR NR		
Lead Acetate	R R		
Lead Chloride	R R		
Lead Nitrate	R R		
REAGENT		TEMPERATURE 73° 180°	
Lead Sulfate -	R R		
Linoleic Acid	R R		
Linoleic Oil	R NR		
Linseed Oil	NR NR		
Lithium Bromide	R R		
Lubricating Oil, ASTM No. 1	R R		
Lubricating Oil, ASTM No. 2	R R		
Lubricating Oil, ASTM No. 3	R NR		
Lux Liquid	R R		
M			
Machine Oil	R R		
Magnesium Carbonate	R R		
Magnesium Chloride	R R		
Magnesium Citrate	R R		
Magnesium Hydroxide	R R		
Magnesium Nitrate	R R		
Magnesium Sulfate	R R		
Maleic Acid	R R		
Malic Acid	R R		
Manganese Chloride	R R		
Mercuric Chloride	R R		
Mercuric Cyanide	R R		
Mercuric Sulfate	R R		
Mercurous Nitrate	R R		
Mercury	R R		
Methylamine	NR NR		
Methyl Alcohol	NR NR		
Methyl Chloride	NR NR		
Methyl Ethyl Ketone	NR NR		
Methyl Iso-Butyl Ketone	NR NR		
Milk	R R		
Mineral Oils	R R		
Mixed Acids	R R		
Molasses	R R		
Muriatic Acid	R NR		
N			
Naptha	R NR		
Naphthalene	NR NR		
Nickel Chloride	R R		
Nickel Nitrate	R R		
Nickel Sulphate	R R		
Nicotine	R R		
Nicotinic Acid	R R		
Nitric Acid, 10%	R R		
Nitric Acid, 25%	R R		
Nitric Acid, 25-70%	R NR		
Nitrobenzene	NR NR		
Nitroglycerine	NR NR		
Nitrous Oxide	R R		
Nitroglycol	NR NR		
O			
Oils And Fats	NR NR		
Oils, Sour Crude	NR NR		
Oleic Acid	R R		
Oleum	NR NR		
Oxalic Acid	R NR		
REAGENT		TEMPERATURE 73° 180°	
Oxygen	R R		
Ozone	R R		
P			
Palmitic Acid, 10%	R R		
Palmitic Acid, 70%	NR NR		
Paraffin	R R		
Peracetic Acid, 40%	NR NR		
Perchloric Acid, 10%	R R		
Perchloric Acid, 15%	NR NR		
Perchloric Acid, 70%	NR NR		
Petroleum Liquifier	R R		
Phenylhydrazine	NR NR		
Phonyldiazine	NR NR		
Hydrochloride	NR NR		
Phosgene, Liquid	NR NR		
Phosphoric Acid, 10%	R R		

ProTherm

CPVC COMPOUNDS

CHEMICAL RESISTANCE

ProTherm CPVC compounds have excellent chemical resistance properties when exposed to a wide range of chemicals and environments. Generally, ProTherm CPVC compounds are resistant to aliphatic hydrocarbons, bases, mineral acids, salts and oxidants. However, end use conditions must be considered before determining the acceptability of using ProTherm CPVC compounds.

Table 1 contains actual chemical immersion test data at 73°F (23°C) and 180°F (82°C). Tensile strength and weight change were measured after 90 day immersion.

Table 2 contains recommendations based on actual chemical resistance testing, experience and reference information. It is recommended that in-service testing be conducted prior to determining the acceptability of using ProTherm CPVC compounds.

TABLE 1

CHEMICAL RESISTANCE TESTING – 90 DAY IMMERSION

CHEMICAL	CONCENTRATION (WEIGHT %)	IMMERSION TEMPERATURE	WEIGHT CHANGE (%)	TENSILE CHANGE (%)
Sodium Hydroxide	50%	73°F/23°C	0.0	-1.3
Sodium Hydroxide	50%	180°F/82°C	-0.1	2.7
Potassium Hydroxide	45%	73°F/23°C	0.1	-2.8
Potassium Hydroxide	45%	180°F/82°C	0.0	3.0
Sulfuric Acid	80%	73°F/23°C	0.0	-1.2
Sulfuric Acid	80%	180°F/82°C	-0.4	-4.3
Sulfuric Acid	93.5%	73°F/23°C	0.0	-2.6
Nitric Acid	25%	73°F/23°C	0.1	-1.7
Nitric Acid	25%	180°F/82°C	0.5	1.2
Nitric Acid	50%	73°F/23°C	0.1	-1.6
Nitric Acid	50%	180°F/82°C	0.6	2.2
Hydrochloric Acid	36%	73°F/23°C	0.3	-3.2
Hydrochloric Acid	36%	180°F/82°C	1.3	6.1
Deionized Water	100%	73°F/23°C	0.2	0.1
Deionized Water	100%	180°F/82°C	0.6	3.3
Sodium Borate	Saturated	73°F/23°C	0.2	0.1
Sodium Carbonate	Saturated	73°F/23°C	0.1	-1.4
Sodium Carbonate	Saturated	180°F/82°C	0.4	2.2
Calcium Chloride	43%	73°F/23°C	0.1	-1.7
Calcium Chloride	43%	180°F/82°C	0.2	0.8
Bleach, Household	—	73°F/23°C	0.1	-0.6
Potassium Persulfate	2%	73°F/23°C	0.2	-1.3
Hydrogen Peroxide	30%	73°F/23°C	0.4	-0.6
Heptane	100%	73°F/23°C	0.0	-1.3
Methanol	100%	73°F/23°C	0.6	-6.5

Georgia Gulf

ProTherm

CPVC COMPOUNDS

CHEMICAL STRESS RESISTANCE

Residential Plumbing Applications

To determine the chemical stress resistance of ProTherm compounds to a variety of substances that may be encountered during residential plumbing applications, injection molded test bars were prepared with a knit line using ProTherm products. The test bars were bent to induce high stress and placed into an apparatus that held them in place.

The test materials were then placed on the bars in the knit line and monitored for 14 days. Any cracking of the test bars was considered a failure.

Diethyl Phthalate (DOP) was used as a control as it is known to generate chemical stress cracking in rigid vinyl.

Several thread sealants, solvent cements, primers, and soldering pastes were tested.

MATERIAL	RESULT
Control	pass
Diethyl Phthalate (DOP)	failed at 4 hours
Rector Seal-Thread Sealant	pass
LA-CO TOT - Pipe Joint Compound	failed at 24 hours
LA-CO - Soldering Paste	pass
Oatey-No. 5 Solder Paste	pass
Bridgit-Soldering Paste	pass
EZ Weld-One step CPVC Solvent Cement	pass
Loctite-Pipe Sealant	pass
LA-CO Slic-tite - Thread Sealant	failed at 4 days
CPVC-PVC Purple Primer	failed at 24 hours
Harvey's Soil Seal	pass

Testing will be ongoing.

Note: Material manufacturers may change formulations without notification to the consumer.

ORION

*****TECHNICAL BULLETIN *****TECHNICAL BULLETIN*****

TO: SALES REPRESENTATIVES
FROM: MICHAEL DENNEHY
SUBJECT: DISADVANTAGES OF SPEARS® LABWASTE™ CPVC CORROSIVE DRAINAGE SYSTEM
DATE: 9/30/02

Recently, Spears Manufacturing Company has introduced a line of CPVC Schedule 40 pipe and drainage fittings trademarked as their LabWaste™ System, which is intended to compete against polypropylene, the standard of the industry. The product literature makes many claims and broad statements as to the benefits of the product. However, the reality of the product is vastly different than the overstated and misleading marketing claims. In many respects, the product falls far short of the requirements for an acid waste system designed to withstand the rigors of laboratory use and the test of time.

A close look at the literature from the manufacturer reveals many of the inherent deficiencies and contradictions. The following is a summary of some of the key points:

(1) CPVC has substantially lower chemical resistance than polypropylene with respect to many of the most common acids and bases used in research institutions. This fact can be documented despite claims in the "front" of the Spears Literature to the contrary. Some specific examples include Nitric Acid, Hydrofluoric Acid, Acetic Acid (vinegar) and Ammonium Hydroxide, each of which will adversely affect CPVC at moderate to high concentrations whereas PP is highly resistant to each of these compounds. These are not extreme "fluff" examples being pointed out for affect. They are among the top ten research chemicals in use in typical research facilities.

(2) In some chemicals for which the chemical resistance charts shows resistance, CPVC can fail while in service due to "chemical stress" cracking, if the material is under stress. An example pointed out right in the caution statements of their literature has to do with stress cracking caused by "surfactants". Well guess what another synonym for surfactants is.....soaps! Imagine a research lab facility where soaps "surfactants" are restricted from use. A common cause of stresses is thermal expansion and contraction due to exothermic reactions from the mixing of acids, bases, water and surfactants! Stresses are also induced from a number of other factors including installation stresses due to bending, joining, disposal of hot waste, direct burial loads, and many other causes.

(3) CPVC can not be tested in most applications for at least 24 hours after joining due to cure time of the joints, and up to a week in cold weather applications. Imagine telling that to a contractor in Chicago who is installing a project in the middle of winter. Also, there is no mechanical joining method available for joining this product in tough to reach or tough to get

to areas, nor is it possible to "dry assemble" the system like in an Electrofusion application. Imagine contractors performing tie-ins with major branch lines that have to be moved axially to be inserted into one another. It is as cumbersome as socket fusion, and even trickier in hot, dry weather when the solvent cement is drying quicker than the work can be performed.

(4) CPVC is not listed by any major plumbing code (e.g. UPC, IPC, etc.) for corrosive waste applications, nor is the specific product listed for such use.

(5) The literature attempts to confuse manufacturers into thinking that the product is suitable for use in plenums. It has not been tested to ASTM E 84, nor U.L. listed and is not acceptable. CAN 102.2-M88 is not E-84 and will not be acceptable to most building codes for use in plenums as a result.

There are other inadequacies with CPVC (single-manufacturer, support issues, breakage in cold weather temperature shock during rapid temperature changes, etc.), as it pertains to acid waste applications. However, the fact that this product lacks the necessary approvals (Plumbing Code Listings, U.L. 723 Listing), should in and by itself make this product inadequate for use in a typical acid waste application in a return air plenum application.

If you have any further questions concerning the use of thermoplastic piping in acid waste, or for acid waste in fire rated areas, contact the Technical Services Department of Orion Fittings, Inc. at (913)-342-1653, or fax us at (800) 777-1653.

November 5, 2002

Mr. Thom Lloyd
PVF Marketing
113 Edgewater Branch Drive
P.O. Box 57577
Jacksonville, FL 32441

Dear Thom:

Re: CPVC usage in acid waste drainage systems

I am writing this letter in response to your recent questions. First, let me say that all thermoplastic materials have a place in the industrial market; however, some are better suited to specific applications due to chemical concentrations, temperature, pressure, construction codes, etc. This letter is intended to highlight a number of issues an end-user or engineer should consider before using a CPVC acid waste system.

Recently, Spears® Manufacturing Company introduced a line of CPVC Schedule 40 pipe and drainage fittings trademarked as their LabWaste™ CPVC Corrosive Waste Drainage System. This system is intended to compete against our polypropylene ENFIELD® and LABLINE™ acid waste systems.

Acid waste piping systems are subject to a variety of chemicals at varying concentrations and temperatures. It is this uncertainty that warrants additional attention during design and has been the dominant factor for the specification of a polypropylene system.

Chemical Resistance of CPVC vs Polypropylene

Laboratories and research facilities are, by nature, places of uncertainty. Constant testing and analysis results in the continuous creation of varied waste chemicals. For this reason the acid waste system should be specified in a manner that will ensure the system is capable of handling the chemicals that are emptied into the system.

In the case of acid waste, CPVC has a lower chemical resistance than polypropylene when exposed to: carboxylic acids including acetic acid and formic acid, ammonium hydroxide, formaldehyde and hydrofluoric acid.

Common immiscible vegetable oils including corn oil, cottonseed oil, and castor oil will cause stress cracking in CPVC acid waste systems.

The main chemical concern for the use of CPVC in acid waste systems involves the disposal of detergents. These include non-ionic detergents, especially ethoxylates and/or propoxylates. These chemicals can cause stress cracking. The risk of stress cracking is greatly increased when there is a possibility of the drains drying out. It is known that non-ionic detergents can react with caustic solutions to produce byproducts such as glycol-ethers. If such a reaction occurred within a drain, a polypropylene system would survive; a CPVC system could prematurely fail.

Mr. Thom Lloyd
Page 2
November 5, 2002

Joining Process: CPVC vs Polypropylene

Spears® CPVC pipe and fittings are joined together by solvent cement. This joining process can only be completed one joint at a time. CPVC solvent cement joints in most applications must be allowed to cure for at least 24 hours (even longer in cold temperatures) before pressure-testing the system. If leaks are detected the joint must be hot gas welded or cut out and replaced. This is a lengthy process that may require additional equipment and expertise.

Polypropylene acid waste systems have a number of distinct advantages. Multiple electrofusion joints can be completed simultaneously. The acid waste system can be immediately tested after the fusion cycle. Electrofusion joints can be re-connected to the machine and re-fused if a leak is detected. After an electrofusion joint is tested and verified, it will never leak.

IPEX Inc. LABLINE™ mechanical joints can be tightened and re-opened if necessary. Spears® LabWaste™ CPVC systems, comprised solely of solvent cement joints, seems limiting by nature.

Standards

Today there is no known standard that covers the design, manufacture, and testing of a CPVC acid waste system. Spears® LabWaste™ CPVC system is not IAPMO listed or third-party certified by CSA or NSF.

IPEX Inc. acid waste system is third-party certified by NSF to ASTM F1412, ASTM D4101, ASTM D635 and CSA B181.3 "Polyolefin laboratory drainage systems". For the entire list of IPEX Inc. acid waste system standards, see IPEX Inc. Enfield® and LABLINE™ letters of compliance.

Current industry standards for acid waste systems in the US dictate that all materials contained within return air plenums comply with ASTM E84 and have a flame spread rating less than 25 feet and a smoke development classification of less than 50 feet. Spears® LabWaste™ pipe and fittings have not been tested to these industry-wide regulations.

If you have any further questions concerning the use of thermoplastic piping in acid waste, or for acid waste systems in fire-rated locations, please feel free to contact the Technical Sales department of IPEX Inc. at (800) 463-9572.

Yours truly,

Patrick Fedor
Regional Engineer, Industrial, US

cc: Regional Managers



LabWaste™ CPVC Technical Information & Installation Guide

Chemical Resistance Tables

Resistance Rating Codes

R = Recommended

C = Use with Caution.

N = Not Recommended.

--- = No data available

IMPORTANT NOTE: Chemical Resistance data is provide for material compatibility information purposes only and in no way addresses the legal discharge of chemicals into any waste system, some of which may be prohibited by law. Nor does the data address the compatibility of chemical mixtures, issues of hazardous decomposition, or other potentially dangerous circumstances that might be involved. Data is applicable to laboratory drainage systems only and may not be suitable for continuous service or pressure applications.

CHEMICAL	RATING	CHEMICAL	RATING	CHEMICAL	RATING
A					
Acacia, Gum Arabic	R	Ammonium Nitrate	R	Bromphenol Blue	R
Acetaldehyde	R	Ammonium Persulfate	R	Bromthymol Blue	R
Acetamide	R	Ammonium Phosphate	R	Butadiene	R
Acetic Acid Vapor 25%	R	Monobasic/Dibasic	R	Butane	R
Acetic Acid 60%	R	Ammonium Sulfate	R	Butyl Acetate	C
Acetic Acid 85%	R	Ammonium Sulfide	R	Butyl Alcohol	C
Acetic Acid Glacial	R	Ammonium Sulfite	R	Butyl Cellosolve	R
Acetic Anhydride	R	Ammonium Thiocyanate	R	n-Butyl Chloride	---
Acetone	R	Amyl Acetate	C	Butylene (C)	---
Acetophenone	C	Amyl Alcohol 1%	R	Butyl Phenol	C
Acetyl Chloride	R	Amyl Alcohol >1%	C	Butyl Phthalate	---
Acetylene	N	n-Amyl Chloride	C	Butyl Stearate	---
Acetylnitrile	R	Aniline	C	Butynediol	---
Acetylsalicylic acid, aspirin	R	Aniline Chlorohydrate	C	Butyric Acid	R
Acrylic Acid	R	Aniline Hydrochloride	C		
Acrylonitrile	R	Anthraquinone	R	C	
Adenine, 6-aminopurine	R	Anthraquinone Sulfonic Acid	R	Cadmium Cyanide	R
Adenosine Triphosphate	R	Antimony Trichloride	R	Calcium Acetate	R
Adipic Acid	R	Aqua Regia	R	Calcium Bisulfide	R
Agarose	R	Argon	---	Calcium Bisulfate	R
Alizarin stain	R	Arsenic Acid	R	Calcium Carbonate	R
Mordant Red 11	R	Aryl Sulfonic Acid	R	Calcium Chlorate	R
Alizarin Red S	R	Ascorbic Acid	R	Calcium Chloride	R
Mordant Red 3	R	L-Asparagine	R	Calcium Fluoride	R
Alizarin Yellow R	R	Asphalt	N	Calcium Hydroxide	R
Mordant Orange 1	R			Calcium Hypochlorite	R
Allyl Alcohol	R	B		Calcium Nitrate	R
Allyl Chloride	N	Barium Acetate	R	Calcium Oxide	R
Aluminum Acetate	R	Barium Carbonate	R	Calcium Sulfate	R
Aluminum Ammonium	R	Barium Chloride	R	Camphor	---
Aluminum Chloride	R	Barium Hydroxide	R	Cane Sugar Liquors	R
Aluminum Fluoride	R	Barium Nitrate	R	Caprylic Acid	---
Aluminum Hydroxide	R	Barium Sulfate	R	Carbitol	---
Aluminum Nitrate	R	Barium Sulfide	R	Carbolic Acid	R
Aluminum Oxychloride	R	Beer	R	Carbon Dioxide Dry	R
Aluminum Potassium	R	Beer Sugar Liquors	R	Carbon Dioxide Wet	R
Aluminum Potassium Sulfate, Alum	R	Benzaldehyde	R	Carbon Disulfide	C
Aluminum Sulfate	R	Benzene	C	Carbon Monoxide	R
Ammonia Anhydrous	R	Benzene Sulfonic Acid	R	Carbon Tetrachloride	N
Ammonia Gas	R	Benzoic Acid	R	Carbonic Acid	R
Ammonia Liquid	R	Benzyl Alcohol	R	Castor Oil	C
Ammonia Acetate	R	Bismuth Carbonate	R	Caustic Potash	R
Ammonium Bicarbonate	R	Biuret	R	Caustic Soda	R
Ammonium Bifluoride	R	Black Liquor	R	Cellosolve	C
Ammonium Bisulfide	R	Bleach 5%	R	Cellosolve Acetate	R
Ammonium Bromide	R	Bleach 12%	R	Chloral Hydrate	R
Ammonium Carbonate	R	Blood	R	Chloramine	R
Ammonium Chloride	R	Borax	R	Chloric Acid	R
Ammonium Citrate	R	Boric Acid	R	Chloric Acid 20%	R
Ammonium Dichromate	R	Brake Fluid	---	Chlorine, Aqueous	R
Ammonium Dihydrogen Phosphate	R	Brine	R	Chlorinated Water 10 PPM	R
Ammonium Ferric Sulfate	R	Brilliant Blue G-250	R	Chlorinated Water Sal'd	R
Ammonium Ferrous Sulfate	R	Brilliant Blue R-250	R	Chloroacetic Acid	R
Ammonium Fluoride 10%	R	Brilliant Cresyl Blue	R	Chloroacetyl Chloride	---
Ammonium Fluoride 25%	R	Brilliant Green	R	Chlorobenzene	N
Ammonium Hydroxide 10% - 28%	R	Bromocresol Green	R	Chlorobenzyl Chloride	N
Ammonium Hydroxide 100%	R	Bromocresol purple	R	Chloroform	N
Ammonium Iodide	R	Bromic Acid	R	Chlorophenol Red	R
		Bromine Liquid	R	Chloroplatin	---
		Bromine Vapor	R	Chlorosulfonic Acid	R
		Bromine Water	R	Chromic Acid 10%	R
		Bromotoluene	---	Chromic Acid 30%	R
				Chromic Acid 40%	R

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CHEMICAL	RATING	CHEMICAL	RATING	CHEMICAL	RATING
Chromic Acid 50%	C	Ethyl Ether	R	Hydrogen Sulfide Dry	R
Chromium	R	Ethyl Formate	R	Hydrogen Sulfide Wet	R
Chromium Tetroxide	R	Ethylene Glycol	R	Hydrogen Sulfide, aqueous	R
Citric Acid	R	2-Ethylhexanol	R	Hydroquinone, aqueous	R
Clayton Yellow	R	Ethyl Mercaptan	R	Hydroxylamine Hydrochloride	R
Coconut Oil	C	Ethyl Oxalate	R	Hydroxylamine Sulfate	R
Coffee	R			Hypochlorous Acid	R
Congo Red solution	R		F		I
Copper Acetate	R	Fast Green FCF	R	Indigo Carmine	R
Copper Carbonate	R	Fatty Acids	R	Inks	R
Copper Chloride	R	Fehlings solution A	R	Iodine	R
Copper Cyanide	R	Fehlings solution B	R	Iodine solution, Lugol's	R
Copper Fluoride	R	Ferric Ammonium Sulfate	R	Iron Phosphate	—
Copper Nitrate	R	Ferric Chloride	R	Isobutane	C
Copper Sulfate	R	Ferric Hydroxide	R	Isobutyl Alcohol	R
Corn Oil	C	Ferric Nitrate	R	Isocetane	R
Corn Syrup	R	Ferric Sulfate	R	Isopropyl Acetate	R
Cottonseed Oil	C	Ferrous Chloride	R	Isopropyl Alcohol	R
m-Cresol Purple	R	Ferrous Hydroxide	R	Isopropyl Chloride	N
Cresal Red	R	Ferrous Nitrate	R	Isopropyl Ether	R
Cresosote	N	Ferrous Sulfate	R	Isophorone	R
Cresol	N	Fish Oil	R		J
Cresylic Acid	R	Fluoboric Acid	R	Janus Green	R
Croton Aldehyde	R	Fluorine Gas (Dry)	R	JP-3 Fuel	R
Crude Oil	C	Fluorine Gas (Wet)	R	JP-4 Fuel	R
Cumene	R	Fluosilicic Acid 30%	R	JP-5 Fuel	R
Cupric Chloride	R	Fluosilicic Acid 50%	R	JP-6 Fuel	R
Cupric Fluoride	R	Formaldehyde Dilute	R		K
Cupric Nitrate	R	Formaldehyde 35%	R		L
Cupric Sulfate	R	Formaldehyde 37%	R	Lactic Acid 25%	R
Cuprous Chloride	R	Formaldehyde 50%	C	Lactic Acid 80%	R
Cyclohexane	R	Formic Acid	R	Lactose	R
Cyclohexanol	R	Freon	R	Lard Oil	C
Cyclohexanone	R	Freon 12	R	Latex	—
	D	Freon 21	—	Lauric Acid	R
Decahydronaphthalene	R	Freon 22	R	Lauryl Chloride	R
Detergents	R	Freon 113	C	Lead Acetate	R
Dextrin	R	Freon 114	—	Lead Chloride	R
Dextrose	R	Fructose	R	Lead Nitrate	R
Diacetone Alcohol	R	Furfural	R	Lead Sulfate	R
Diastase of malt	R		G	Lemon Oil	R
Dibutoxyethyl Phthalate	N	Gallic Acid	R	Ligroin	R
Dibutyl Ether	R	Gasoline	R	Limone	R
Dibutyl Phthalate	N	Gasohol	R	Lime Slurry	R
Dibutyl Sebacate	N	Gelatin	R	Lime Sulfur	R
Dichlorobenzene	R	Glauber's Salt	—	Linoleic Acid	C
Dichloroethylene	N	Glucose	R	Linoleic Oil	—
2,6-Dichloroindophenol	N	Glue, PVA	R	Linseed Oil	C
Diesel Fuels	R	Glutathione	R	Liqueurs	R
Diethylamine	R	Glycerine	R	Lithium Bromide	R
Diethyl Cellosolve	R	Glycine	R	Lithium Carbonate	R
Diethyl Ether	R	Glycogen	R	Lithium Chloride	R
Diglycolic Acid	R	Glycol	C	Lithium Hydroxide 50%	R
Dimethylamine	R	Glycol Amine	—	Lithium Nitrate	R
Dimethyl Formamide	R	Glycolic Acid	R	Lithium Sulfate	R
Dimethylhydrazine	R	Glyoxal	R	Lubricating Oil #1	R
Dimethyl Phthalate	N	Grape Sugar	R	Lubricating Oil #2	R
Dimethyl Sulfoxide	N	Grease	—	Lubricating Oil #3	R
Dioctyl Phthalate	N	Green Liquor	R	Ludox	—
Dodecyl Alcohol	R		H	Luminol 3-amino	R
Dodecyl Sulfate	R	Heptane (Type 1)	R	Phthalhydrazide	R
Dioxane	R	n-Hexane	R	DL-lysine Hydrochloride	R
Diphenyl Oxide	—	Hexamethylenediamine	R	Lysozyme	R
Disodium Phosphate	R	Hexanol, Tertiary	R		M
Oriente	R	Hydraulic Oil	—	Magnesium Acetate	R
	E	Hydrazine	R	Magnesium Bromide	R
Eosin Y	R	Hydrobromic Acid 20%	R	Magnesium Carbonate	R
Eriochrome Black T	R	Hydrobromic Acid 50%	R	Magnesium Chloride	R
Ether	R	Hydrochloric Acid 10%	R	Magnesium Citrate	R
Ethyl Acetate	R	Hydrochloric Acid 30%	R	Magnesium Fluoride	—
Ethyl Acetoacetate	R	Hydrocyanic Acid	R	Magnesium Hydroxide	R
Ethyl Acrylate	R	Hydrofluoric Acid Dilute	R	Magnesium Nitrate	R
Ethyl Alcohol	R	Hydrofluoric Acid 30%	R	Magnesium Oxide	—
Ethyl Benzene	C	Hydrofluoric Acid 50%	R	Magnesium Sulfate	R
Ethyl Chloride	N	Hydrofluoric Acid 100%	R	Malachite Green	R
Ethyl Chloroacetate	N	Hydrofluosilicic Acid 50%	R		
Ethylene Bromide	N	Hydrogen	R		
Ethylene Chloride	N	Hydrogen Cyanide	R		
Ethylene Chlorohydrin	N	Hydrogen Fluoride	C		
Ethylenediamine	R	Hydrogen Peroxide 50%	R		
Ethylene Dichloride	N	Hydrogen Peroxide 90%	R		
Ethylene Glycol	C	Hydrogen Phosphide	R		
Ethylene Oxide	R				



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CHEMICAL	RATING	CHEMICAL	RATING	CHEMICAL	RATING
Maleic Acid	R	Orange IV - acid orange 5	R	Potassium Nitrate	R
Malic Acid	R	Orcinol	R	Potassium Perborate	R
Maltose	R	Osmium Tetroxide	R	Potassium Perchlorate	R
Manganese Chloride	R	Oxalic Acid	R	Potassium Permanganate 10%	R
Manganese Nitrate	R	Oxygen Gas	R	Potassium Permanganate 25%	R
Manganese Sulfate	R	Ozone	R	Potassium Persulfate	R
Menthol	R	Ozonized Water	R	Potassium Phosphate	R
Mercuric Chloride	R		P	Potassium Sodium Tartrate	R
Mercuric Cyanide	R			Potassium Sulfate	R
Mercuric Sulfate	R			Potassium Sulfide	R
Mercurous Nitrate	R			Potassium Sulfite	R
Mercury	R			Potassium Thiocyanate	R
Methane	R			Propane	R
Methanol	R			Propargyl Alcohol	R
DL-methionine	R			Propionic Acid	R
Methoxyethyl Oleate	---			Propyl Acetate	---
Methyl Acetate	R			Propyl Alcohol	R
Methyl Acetone	---			N-Propyl Bromide	---
Methyl Acrylate	---			Propylene Dichloride	N
Methyl Amine	R			Propylene Glycol	R
Methyl Bromide	N			Propylene Oxide	R
Methyl Cellosolve	R			Pyridine	R
Methyl cellulose	R			Pyrogallol Acid	R
Methyl Chloride	N			Pyrorole	R
Methyl Chloroform	N				Q
Methyl Ethyl Ketone	R			Quinine Sulfate	R
Methyl Formate	R			Quinine Chloride Dihydrate	R
Methyl Green	R			Quinone	---
Methyl Isobutyl Carbinol	R				R
Methyl Isobutyl Ketone	R				
Methyl Isopropyl Ketone	R				
Methyl Methacrylate	R				
Methyl Red	R				
Methyl Sulfate	R				
Methyl Violet-2B	R				
Methyl Violet-6B	R				
Methylene Blue	R				
Methylene Bromide	N				
Methylene Chloride	N				
Methylene Chlorobromide	N				
Methylene Iodine	N				
Methylsulfuric Acid	R				
Milk	R				
Mineral Oil	R				
Molasses	R				
Monochloroacetic Acid	R				
Monochlorobenzene	N				
Monothanolamine	R				
Monosodium Glutamate	R				
Motor Oil	R				
Morpholine	R				
	N				S
Naphtha	R			Safranin O	R
Naphthalene	C			Salicylaldehyde	N
Natural Gas	R			Salicylic Acid	R
Neutral Red	R			Selenic Acid, Aq.	R
Nickel Acetate	R			Silicic Acid	R
Nickel Ammonium Sulfate	---			Silicone Oil	R
Nickel Chloride	R			Silver Acetate	R
Nickel Nitrate	R			Silver Chloride	R
Nickel Sulfate	R			Silver Cyanide	R
Nicotine	R			Silver Nitrate	R
Nicotinic Acid	R			Silver Sulfate	R
Nitric Acid 10%	R			Soaps	R
Nitric Acid 30%	R			Sodium Acetate	R
Nitric Acid 40%	R			Sodium Alum	R
Nitric Acid 50%	R			Sodium Aluminate	R
Nitric Acid 70%	R			Sodium Arsenate	R
Nitric Acid 100%	N			Sodium Benzoate	R
Nitrobenzene	C			Sodium Bicarbonate	R
Nitroethane	---			Sodium Bichromate	R
Nitrogen Gas	---			Sodium Bisulfate	R
Nitroglycerine	C			Sodium Bisulfite	R
Nitrolycol	---			Sodium Borate	R
Nitromethane	C			Sodium Bromide	R
Nitrous Acid	R			Sodium Carbonate	R
	O			Sodium Chlorate	R
n-Octane	C			Sodium Chloride	R
Octanol	R			Sodium Chlorite	R
Oleic Acid	R			Sodium Chromate	R
Oleum	R			Sodium Citrate	R
Olive Oil	C			Sodium Citrate	R
Orange G - acid orange 10	R			Sodium Cyanide	R
				Sodium Dichromate	R
				Sodium Diphenylamine Sulfonate	R
				Sodium Dithionite	R
				Sodium Ferricyanide	R
				Sodium Ferrocyanide	R
				Sodium Fluoride	R
				Sodium Hexametaphosphate	R
				Sodium Hydroxide 15%	R
				Sodium Hydroxide 30%	R
				Sodium Hydroxide 50%	R
				Sodium Hydroxide 70%	R
				Sodium Hypochlorite	R
				Sodium Iodate	R
				Sodium Iodide	R
				Sodium Metabisulfite	R

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CHEMICAL	RATING	CHEMICAL	RATING
Sodium Metaphosphate	R	U	
Sodium Nitrate	R		
Sodium Nitrite	R	Urea	R
Sodium Palmitate	R	Urease	R
Sodium Perborate	R	Urine	R
Sodium Perchlorate	R	V	
Sodium Periodate	R		
Sodium Peroxide	R	Varnish	—
Sodium Phosphate Acid	R	Vaseline	C
Sodium Phosphate Alkaline	R	Vegetable Oil	C
Sodium Phosphate Neutral	R	Vinegar	R
Sodium Propionate	R	Vinyl Acetate	R
Sodium Silicate	R	W	
Sodium Sulfate	R		
Sodium Sulfide	R	Water, Acid Mine	R
Sodium Sulfite	R	Water, Deionized	R
Sodium Thiocysulphate	R	Water, Distilled	R
Sour Crude Oil	R	Water, Potable	R
Soybean Oil	C	Water, Salt	R
Stannic Chloride	R	Water, Sea	R
Stannous Chloride	R	Water, Soft	R
Stannous Sulfate	R	Water, Waste	R
Starch	R	Whiskey	R
Stearic Acid	R	White Liquor	R
Streptomycin Sulfate	R	Wine	R
Strontium Bromide	R	X	
Strontium Chloride	R		
Styrene	N	Xylene	C
Succinic Acid	R	Z	
Sugar	R		
Sulfamic Acid	R	Zinc Acetate	R
Sulfate Liquors	R	Zinc Carbonate	R
Sulfite Liquors	R	Zinc Chloride	R
Sulfur	R	Zinc Nitrate	R
Sulfur Chloride	R	Zinc Stearate	R
Sulfur Dioxide Gas Dry	R	Zinc Sulfate	R
Sulfur Dioxide Gas Wet	R		
Sulfur Trioxide Gas Dry	—		
Sulfur Trioxide Gas Wet	N		
Sulfuric Acid Up to 30%	R		
Sulfuric Acid 50%	R		
Sulfuric Acid 60%	R		
Sulfuric Acid 70%	R		
Sulfuric Acid 80%	R		
Sulfuric Acid 90%	R		
Sulfuric Acid 93%	R		
Sulfuric Acid 94%	R		
Sulfuric Acid 95%	R		
Sulfuric Acid 96%	R		
Sulfuric Acid 98%	R		
Sulfuric Acid 100%	R		
Sulfurous Acid	R		
T			
Tall Oil	R		
Tannic Acid	R		
Tanning Liquors	R		
Tar	C		
Tartaric Acid	R		
Terpineol	—		
Tetrachloroethane	N		
Tetrachloroethylene	N		
Tetracycline hydrochloride			
Tetraethyl Lead	R		
Tetrahydrofuran	R		
Tetralin	N		
Thiamine Hydrochloride	R		
Thionin	R		
Thionyl Chloride	R		
Thymol	R		
Titanium Dioxide	R		
Titanium Tetrachloride	R		
Toluene	C		
Tomato Juice	R		
Transformer Oil	R		
Transformer Oil DTE/30	R		
Tributyl Citrate	—		
Tributyl Phosphate	R		
Trichloroacetic Acid	R		
Trichloroethylene	N		
Triethanolamine	R		
Triethylamine	R		
Trimethylpropane	R		
Trisodium Phosphate	R		
Trypsin	R		
Tung Oil	C		
Turpentine	C		

**Chemicals Not Recommended for Use with CPVC Piping by the Piping Industry,
But Found to be Compatible in DWV Applications**

CHEMICAL

-A-

Acetaldehyde
Acetic Acid glacial
Acetic Anhydride
Acetone 100%
Acetyl Chloride
Acetylnitrile
Acrylic Acid
Acrylonitrile
Ammonia Gas
Ammonia Liquid
Ammonium Hydroxide
Amyl Acetate
Amyl Chloride
Aniline
Aniline Chlorohydrate
Aniline Hydrochloride

-B-

Benzaldehyde
Benzene
Benzyl Alcohol
Bromine Liquid
Butadiene
Butyl Acetate
Butyl Cellosolve
Butyric Acid 100%

-C-

Carbon Disulfide
Cellosolve
Cellosolve Acetate
Chloramine
Croton Aldehyde
Cumene
Cyclohexane
Cyclohexanol
Cyclohexanone

-D-

Diacetone Alcohol
Dichlorobenzene
Diethylamine
Dimethylamine
Diethyl Ether
Dimethyl Formamide
Dioxane

-E-

Ether
Ethyl Acetate
Ethyl Acetoacetate
Ethyl Acrylate
Ethyl benzene
Ethyl Ether
Ethylenediamine
Ethylene Oxide

CHEMICAL

-F,G-

Furfural
Gasoline
Gasohol

-H,I-

Hydrofluoric Acid 100%
Hydrazine
Isopropyl Acetate
Isopropyl Ether

-L-

Lemon Oil
Limonene

-M-

Methanol 100%
Methyl Acetate
Methyl Amine
Methyl Cellosolve
Methyl Ethyl Ketone
Methyl Isobutyl Carbinol
Methyl Isobutyl Ketone
Methyl Isopropyl Ketone
Methyl Methacrylate
Monoethanolamine

-N,O-

Naphthalene
Nitroglycerine
Oleum

-P-

Palm Oil
Peracetic Acid
Phenylhydrazine
Phosphorous Trichloride
Picric Acid
Pine Oil
Propionic Acid
Propylene Oxide
Pyridine

-S,T-

Soybean Oil
Tar
Tetrahydrofuran
Thionyl Chloride
Toluene
Tributyl Phosphate
Turpentine

-V-

Vaseline
Vinyl Acetate

-X-

Xylene

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